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A revision of the Indo-Pacific species of *Ooencyrtus* (Hymenoptera: Encyrtidae), parasitoids of the immature stages of economically important insect species (mainly Hemiptera and Lepidoptera)

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SYNOPSIS. This revision treats 70 species of the genus *Ooencyrtus* found in the Indo-Pacific region, including south China, but excluding Australia and New Zealand. One new generic and 7 new specific synonymies are proposed, 49 species are described as new and 11 lectotypes are designated. Each species is characterized by a diagnosis and/or full species description, its known distribution and hosts are reviewed, and a key is provided to the females.

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INTRODUCTION

The genus *Ooencyrtus* is of particular interest because it is widespread and species-rich in all geographic regions and its species parasitise diverse hosts and host stages. Many species parasitise immature stages of pest species and thus have potential value as biological control agents. Some species also act as minor pests by parasitising eggs of butterflies being reared for commercial purposes in Malaysia and Thailand.

This interest is reflected by the relatively large amount of material of the genus that is received by the identification services of the The Natural History Museum and International Institute of Entomology from the Indo-Pacific region. Unfortunately, identification is difficult because the taxonomy of the genus in this part of the world is inadequate. This revision was undertaken as a first step towards improving this situation and it is perhaps not surprising that of the 70 species treated here, more than two-thirds are described as new.

BIOLOGY OF *OOENCYRTUS*

Host range

The majority of species are parasitoids of the eggs of Hemiptera or Lepidoptera, but species are known that attack the prepupae of Lepidoptera, braconid primary parasitoids of caterpillars (Lepidoptera), immature stages of Dryinidae attacking auchenorrhynchous Homoptera, nymphal stages of Aphididae (Homoptera), immature stages of Syrphidae (Diptera) or Coccinellidae (Coleoptera) feeding on aphids, or the pupae of Chloropidae (Diptera).

Host specificity

The degree of host specificity is not known with any certainty. Some species appear to act only as solitary parasitoids of lepidopterous eggs laid in batches, such as *pinicolus* which parasitises the eggs of Lymantriidae and Lasiocampidae (see Trjapitzin, 1989). Other species may be parasitoids of the eggs of Heteroptera or Lepidoptera which are laid in batches, e.g. *pityocampae* which will parasitize the eggs of Lasiocampidae, Notodontidae (Lepidoptera) as well as Coreidae and Pentatomidae (Hemiptera), although the same species has also been recorded as a parasitoid of the solitary eggs of Sphingidae (Battisti *et al.*, 1988). At least one species is known to be a gregarious parasitoid of the solitary eggs of butterflies, e.g. *papilionis* (see p. 79). Two species are known to attack different stages of hosts in different orders. *Ooencyrtus kuvanae*, has been recorded both as a primary solitary parasitoid of the eggs of gypsy moth (*Lymantria dispar*) and as a gregarious hyperparasitoid of the prepupal and pupal stages of the moth's braconid primary parasitoid. Muesebeck & Dohanian (1927) found that female *kuvanae* from field-collected gypsy moth eggs would oviposit into the immature stages of *Apanteles melanoscelus* within their cocoons after they had emerged from the gypsy moth caterpillar. Up to 17 individuals subsequently issuing from a single braconid host. The same species of *Ooencyrtus* has also been recorded as a primary parasitoid of *Anastatus bifasciatus* Fonscolombe in gypsy moth eggs (Howard & Fiske, 1911), although Crossman (1925) stated that he knew of only one such case in 14 years of working with these species. *Ooencyrtus submetallicus* (Howard) is best known as a primary parasitoid of the heteropterous eggs, but it has also been recorded as a parasitoid of the pupae of a chloropid dipteran (Legner & Bay, 1965a,b).

Ovary development

Adult females emerge from the host with undeveloped ovaries and the preoviposition period may vary from 1.5 to nearly four days depending on temperature (Tracy & Nechols, 1988).

Mating

Mating has been described in detail only for *kuvanae* (Brown, 1984). Females may mate several times, but if they participate in a post-mating ritual they will mate only once. The post-mating ritual involves the pair facing each other and the male touching the female with his antennae, fore legs and head. The female touches the male with her mouthparts at this time. Newly emerged, mating females may be swarmed over by males if populations are large. Mating males appear to clean the female with their mouthparts, they may also try to mate with a female before her wings are fully expanded.

Host finding and oviposition

Evidence suggests that, in at least two species (*fecundus* and *pityocampae*), female adult parasitoids are attracted to chemicals or odours pro-

duced by the adult female host (Laraichi & Voegelé, 1975; Battisti, 1989). This may be the result of the parasitoid being conditioned by encountering suitable freshly laid eggs after the mass emergence of a suitable host species (Battisti, 1989). Oviposition may take some time depending upon the experience of the parasitoid. In *kuvanae* experienced females may take only five minutes to deposit an egg after the initial encounter whilst inexperienced females may take nearly twice as long (Lee & Lee, 1989), whilst in gregarious species oviposition may take nearly an hour per single host, e.g. *johnsoni* (Maple, 1937). Host feeding, by the adult parasitoid, has been observed in at least two species (*kuvanae*, Lee & Lee, 1989; *johnsoni*, Maple, 1937) and is almost certainly common throughout the genus.

Fecundity

The species of host egg can influence fecundity (Laraichi, 1978a). Host density does not affect fecundity but lower host density increases the rate of superparasitism in solitary parasitoids (Laraichi, 1978b). The maximum overall fecundity may be as high as 200 (Crossman, 1925). In species that parasitise egg clusters the number of eggs deposited by the parasitoid will be limited to the number of mature eggs present in the ovaries, in *nezarae* this averages about 17 (Takasu & Hirose, 1991). In *kuvanae* this normally results in a lower percentage parasitism of larger egg masses resulting from egg limitation (Weseloh, 1972; Williams *et al.*, 1990). Percentage parasitism in *kuvanae* may be as high as 80%, but is generally around 10–40%. The substrate on which the host eggs are laid may affect rate of parasitism. In *kuvanae*, the eggs of its host on red maple (smooth bark) have a higher rate of parasitism than those on oak (rough bark) (Bellinger *et al.*, 1988).

Immature stages

After oviposition the egg stalk remains protruding through the chorion of the host egg. The larva remains attached to its egg shell for the first three instars and is metapneustic (Maple, 1937), being able to utilise atmospheric air directly through the protruding part of the egg (Maple, 1937). The number of larval instars recorded varies from three (Gerling *et al.*, 1976 in *trinidadensis*; Matteson, 1981 in *utetheisae*; Crossman, 1925 in *kuvanae*), four (Maple, 1937 in *johnsoni*; Laraichi, 1977 in *fecundus*, *nigerrimus* and *telenomicida*) to five (Parker, 1933 in *kuvanae*; Takasu & Hirose, 1989 in *nezarae*). The true number of instars is probably four or five since these counts are based on the mandibles of the exuviae of previous instars which remain attached to the anal shield of the final instar larva.

Development time

In both *kuvanae* and *anasae* development from egg to adult takes about 18–35 days depending on temperature (Muesebeck & Dohanian, 1927; Tracy & Nechols, 1987). In *manii* no development of immatures occurs if the temperature is over 32.5°C (Rahim *et al.*, 1991). *O kuvanae* has 4 or 5 generations per year in more northerly parts of the USA (Crossman, 1925) and up to 7 generations per year in Italy (Prota, 1966) and overwinters as an adult.

Adult longevity

In *manii* longevity of both sexes decreases with an increase in temperature, males will live 4 to 1.2 days with temperatures of 15–36°C whilst females live from 10–1.7 days at the same temperatures. In general, longevity increases with an increase in humidity, with optimum at 50–70% RH (Rahim *et al.*, 1991). This is also reflected by longevity and fecundity of the same species during different seasons, the highest fecundity (37 eggs/female) being noted in April and the lowest (0.8 eggs/female) being noted in January and February (Yadav & Chaudhary, 1984). In some species day length may effect reproduction and longevity. For instance, in *kuvanae* longer day length results in more progeny but lower longevity (Weseloh, 1986).

Sex ratio and sex determination

The sex ratio varies from about to 1:1 to 4:1 in favour of females (*johnsoni* Maple, 1937). In *anasae* the proportion of females increases with number of hosts parasitized (Tracy & Nechols, 1987). Sex ratio may also be influenced by temperature. For instance, in *fecundus* (Laraichi, 1978c) all progeny are female if the ovipositing female is subjected to temperatures of 30°C but all progeny are male if the ovipositing female is subjected to a temperature of 35°C (Laraichi, 1978c). In *O. submetallicus* similar temperatures produce similar results with hermaphrodite mosaics being produced if the developing progeny are subjected to intermediate temperatures (Wilson, 1962; Wilson & Woolcock, 1960). This suggests that the sex of the offspring may be under the control of a microorganism similar to

that found in some species of *Trichogramma* (see Stouthamer *et al.*, 1990; Stouthamer, 1990, 1991). However, Kamay (in Brown, 1984) reported that if developing *kuvanae* were exposed to temperatures of around 35°C this resulted in a higher proportion of females, possibly because of higher male mortality. Seasonal fluctuations of temperature influence the sex ratio of *manii* (Yadav & Chaudhary, 1984).

SYNOPSIS OF HOSTS OF INDO-PACIFIC SPECIES

[] extralimital records
* probably incorrect host association
! laboratory reared
(H) hyperparasitoid

All reared from eggs except those prefixed by (L) – from larvae, and (P) – from prepupae or pupae.

HOST	PARASITOID (*Ooencyrtus* sp.)
Unknown eggs	*ceres*
COLEOPTERA	
Chrysomelidae	
Plesispa reichei Chapius	*pindarus*
Podontia quatuordecimpunctata (Linnaeus)	*corbetti*
Podontia quatuordecimpunctata (Linnaeus)	*podontiae*
Coccinellidae	
(P)indet.	*guamensis* *
DIPTERA	
Syrphidae	
(P)*Allograpta exotica* (Wiedemann)	*guamensis*
(L)*Dideopsis pura* (Curran)	*guamensis*
(L)[*Ischiodon scutellaris* (Fabricius)	*guamensis*]
(L)[*Ischiodon aegyptius* Wied (Wiedemann)	*guamensis*]
(L)*Paragus auritus* Stuckenberg	*guamensis*
HEMIPTERA	
indet family	*ferrierei*
Heteroptera	
Alydidae	
Leptocorisa sp.	*utetheisae*
Leptocorisa acuta Thunberg	*utetheisae*
[*Mirperus jaculus* (Thunberg)	*utetheisae*]
Piezodorus hybneri (Fabricius)	*utetheisae*
Riptortus sp.	*cybele*
Riptortus sp.	*utetheisae*
[*Riptortus dentipes* (Fabricius)	*utetheisae*]
Coreidae	
Amblypelta sp.	*caurus*
Amblypelta cocophaga China	*ilion*
Amblypelta lutescens Distant	*caurus*
Amblypelta papuensis Brown	*utetheisae*
	caurus
[*Anoplocnemis curvipes* (Fabricius)	*utetheisae*]

[*Clavigralla elongata* Signoret	*utetheisae*]
[*Clavigralla tomentosicollis* Stål	*utetheisae*]
Dasynus kalshoveni Blöte	*icarus*
Dasynus piperis China	*utetheisae*
[*Gonocerus acutangulatus* Goeze	*telenomicida*]
[*Gonocerus juniperi* Herich-Schaeffer	*telenomicida*]
Mictis profana (Fabricius)	*utetheisae*
[*Pseudotheraptus wayi* Brown	*utetheisae*]
Pentatomidae	
indet.	*lucens*
[*Brachynema germarii* (Kolenati)	*telenomicida*]
[*Dolycoris penicillatus* Horváth	*telenomicida*]
Eocanthecona furcellata (Wolff)	*iulus*
Nezara viridula (Linnaeus)	*utetheisae*
Plataspidae	
Brachyplatys pacificus (Dallas)	*pacificus*
Cratoplatys sp.	*ceres*
Scutelleridae	
[*Eurygaster integriceps* Puton	*telenomicida*]
[*Aelia* sp.	*telenomicida*]
Tessaratomidae	
Tessaratoma papillosa (Drury)	*phongi*
Tessaratoma javanica (Thunberg)	*phongi*
Pycanum ponderosum Stål	*phongi*
Homoptera	
indet. family	*midas*
Lophopidae	
Pyrilla spp.	*manii*
Pyrilla perpusilla Walker	*manii*
Aphididae	
(L)indet.	*pallidipes* *
LEPIDOPTERA	
indet.	*phongi* *
indet.	*javanicus*
indet.	*utetheisae*
(P)indet. leafmining family	*ooii*
Agonoxenidae	
(L)*Agonoxena pyrogramma* Meyrick	*shakespearei*
Arctiidae	
[*Utetheisa pulchella* (Linnaeus)	*utetheisae*
Bombycidae	
Rondotia menciana Moore	*hercle*
Crambidae	
Chilo terenellus Pagenstecher	*papilionis*
Danaidae	
Danaus chrysippus (Linnaeus)	*papilionis*
Euploea core (Cramer)	*papilionis*
Tirumala limniace (Cramer)	*papilionis*
Epipyropidae	
(P)*Epiricania melanoleuca* (Fletcher)	*acus*
Gracillariidae	
(P)*Acrocercops globulifera* Meyrick	*ooii*
(P)*Conopomorpha cramerella* (Snellen)	*ooii*

Heliconiidae	
Heliconius charitonius (Linnaeus)	*papilionis*
Hesperiidae	
Erionota thrax (Linnaeus)	*pallidipes*
Hasora sp.	*papilionis*
Lasiocampidae	
Dendrolimus sp.	*endymion*
Dendrolimus kikuchii Matsumura	*endymion*
Dendrolimus spectabilis Butler	*kuvanae*
Malacosoma americana	!*kuvanae*
Malacosoma neustria tartacea Motschulsky	*kuvanae*
Taragama repanda Hübner	!*telenomicida*
Lymantriidae	
Aroa cometaris Butler	*papilionis*
Euproctis chrysorrhoea (Linnaeus)	!*kuvanae*
Hemerocampa leucostigma Abbot & Smith	!*kuvanae*
Hemerocampa definata Packard	!*kuvanae*
[*Lymantria dispar* (Linnaeus)	*kuvanae*]
[*Lymantria fumida* Butler	*kuvanae*]
Lymantria xylina Swinhoe	?*kuvanae*
[*Nygmia phaeorrhoea* Donovan	*kuvanae*]
[*Stilpnotia salicis* Linnaeus	*kuvanae*]
Noctuidae	
Achaea janata (Linnaeus)	*lucens*
(L)*Exelastis atomosa* (Walsingham)	*guamensis*
Othreis fullonia (Clerck)	*crassulus*
Othreis fullonia (Clerck)	*papilionis*
(L)*Mythimna unipuncta* (Haworth)	*guamensis*
Notodontidae	
Clostera cupreata (Butler)	*lucina*
Stauropus lichenina Butler	*boreas*
Turnaca acuta (Walker)	*macula*
Nymphalidae	
Ariadne ariadne (Linnaeus)	*papilionis*
Caligo memnon (Felder)	*pallidipes*
Hypolimnas bolina Linnaeus	*papilionis*
Kallima sp.	*papilionis*
Phalanta phalantha (Drury)	*papilionis*
Junonia lemonias (Linnaeus)	*papilionis*
Tanaecia julii Bougainville	*papilionis*
Papilionidae	
Troides helena Linnaeus	*papilionis*
Papilio sp.	*papilionis*
Papilio sp.	*plautus*
Papilio aegeus Donovan	*papilionis*
Papilio agamemnon (Linnaeus)	*papilionis*
Papilio citri (?lapsus for *demoleus*	*plautus*
Papilio demoleus Linnaeus	*papilionis*
Papilio helenus Linnaeus	*papilionis*
Papilio memnon Linnaeus	*paplionis*
Papilio polytes Linnaeus	*papilionis*
Papilio rumanzovia Eschscholtz	*papilionis*
Pieridae	
(L)*Delias* sp.	*larvarum*
Eurema sp.	*larvarum*
Hebomoia glaucippe (Linnaeus)	*hera*
Saturniidae	

Attacus atlas Fabricius	*phoebi*
Callosamia promethea Drury	!*kuvanae*
Cricula sp.	*javanicus*
Cricula elaezia Jordan	*dione*
[*Eriogyna pyretorum* Westwood	*kuvanae*]
Hemileuca maia Drury	!*kuvanae*
Hemileuca oliviae Churchill	!*kuvanae*
Sphingidae	
indet.	*endymion*
Amorpha populi austanti Staudinger	!*telenomicida*
Cephonodes hylas (Linnaeus)	*papilionis*
?*Gnathothlibas erotus eras* (Boisduval)	*sphingidarum*
Hippotion celerio (Linnaeus)	*crassulus*
NEUROPTERA	
Myrmeleontidae	
indet.	*ixion*

USE OF *OOENCYRTUS* IN BIOLOGICAL CONTROL

Although species of *Ooencyrtus* undoubtedly play an important role in the regulation of the populations of many insect species worldwide, they have not proven to be of great value in pest control. Their use in classical biological control programmes is summarised in Table 1. Perhaps the best documented example is that of *Ooencyrtus kuvanae* for the control of the gypsy moth (*Lymantria dispar*) in North America and Europe. Brown (1984) comments that although affording some control, the species is unlikely to be of much benefit by itself, although it probably causes a post outbreak collapse which in turn increases the length of the interval between outbreaks.

A further species, *Ooencyrtus fecundus* Ferrière & Voegelé, may be of some benefit if used by means of inundative releases against heteropterous pests of wheat in North Africa (Laraichi & Voegelé, 1975).

DEPOSITORIES

BMNH	The Natural History Museum, London, England
BPBM	Bernice P. Bishop Museum, Hawaii
CNC	Canadian National Collection, Ottawa, Canada
IARI	Indian Agriculture Research Institute, New Delhi, India
IEE	Institito di Entomología Español, Madrid, Spain
IRSN	Institute Royal des Sciences Naturelles de Belgique, Brussels, Belgium
IZAS	Instiute of Zoology, Chinese Academy of Sciences, Beijing, P.R. China
MARI	Malaysian Agricultural Research and Development Institute, Kuala Lumpur, Malaysia
MNHN	Museum National d'Histoire Naturelle, Paris, France
MZB	Museum Zoologicum Bogoriense, Bogor, Indonesia
ORSTOM	Office de la Recherche Scientifique et Technique Outre-Mer, Paris, France
PPRI	Plant Protection Research Institute, Pretoria, South Africa
QMB	Queensland Museum, Brisbane, Australia
TAMU	Texas A&M University, Texas, USA
USNM	United States National Museum, Washington, D.C., USA
ZAMU	Zoology Department, Aligarh Muslim University, Aligarh, India
ZISP	Zoological Institute, St Petersberg, Russia

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Table 1 A summary of the use of *Ooencyrtus* spp. in classical biological control programmes worldwide (Abbreviations: NE – not established; NR – not released; ? – no subsequent information; SC – successful control; P – partial control; E – established but no further information available; NC – established but no significant control achieved).

Target pest species	– Introduced *Ooencyrtus* sp.; country; year; result; source
HEMIPTERA	
Amblypelta cocophaga	– sp.; Solomon Is; 1937–38; NE; Phillips (1941)
	– *malayensis* (?= *utetheisae*, misident.); Solomon Is; 1937–38; NE; Phillips (1941)
Amblypelta theobromae	– *malayensis* (?= *utetheisae*, misident.); Papua New Guinea; ?1974; ?; Young (1982)
Anasa tristis	– *malayensis* (?= *utetheisae*, misident.); USA (Massachusetts); 1981; ?; Coulson *et al.* (1988)
Eurygaster integriceps	– *fecundus*; USSR; ?; NR; Izhevskiy (1988)
	– *nigerrimus*; USSR; ?; NR; Izhevskiy (1988)
	– *telenomicida*; USSR; ?; NR; Izhevskiy (1988)
Murgantia histrionica	– *johnsoni*; Bermuda; 1953; NE; Bennett & Hughes (1959)
	– *johnsoni*; Hawaii; 1940; E; Clausen in Clausen (1978)
Nezara viridula	– *johnsoni*; Australia; 1953; NR; Wilson (1960)
	– *malayensis* (?= *utetheisae*, misident.); USA (Massachusetts); 1981; ?; Coulson *et al.* (1988)
	– *submetallicus*; Australia; 1952–57; NE; Wilson (1960)
	– *submetallicus*; Hawaii; 1962; NE; Davis (1964), Waterhouse & Norris (1987)
	– *submetallicus*; USA (Florida); 1973; ?; CIBC (1974)
	– *trinidadensis*; Hawaii; 1962; NE; Davis (1964), Waterhouse & Norris (1987)
Pseudotheraptus wayi	– sp. (?= *utetheisae*); Zanzibar; 1959; ?; Greathead (1971)
	– sp. (?= *utetheisae*); Kenya; 1959; ?; Greathead (1971)
Soybean stink bugs	– *nezarae*; Brazil; 1983–1985; ?; Kobayashi & Cosenza (1987)
LEPIDOPTERA	
Ascotis selenaria	– *ennomophagus*; Israel; 1977; NR; Wysoki (1979)
Calpodes ethlius	– sp. (= *calpodicus*); Bermuda; 1953, 1962–63; NC; Cock (1985)
	– sp. (= *calpodicus*); St Vincent; 1950–51; E; Cock (1985)
Conopomorpha cramerella	– sp. (= *ooii*); Malaysia (Sabah); 1987; NE; CIBC (1988, 1989, 1990)
Erionota thrax	– *pallidipes*; Hawaii; 1973; SC; Mau, et al. (1980)
	– *pallidipes*; Mauritius: 1971–72; P; Waterhouse & Norris (1989)
Hemerocampa leucostigma	– *kuvanae*; USA; 1917, 1921; NE; Dowden (1962)
Hemileuca oliviae	– *kuvanae*; USA (New Mexico); 1913–16; NE; Clausen (1956)
Lymantria dispar	– *kuvanae*; Algeria; 1925–26, 1931; E; Lepigre (1932), Clausen (1978)
	– *kuvanae*; Canada (Ontario); 1976; E; Brown (1984)
	– *kuvanae*; Czechoslovakia; 1922; E; Clausen (1978)
	– *kuvanae*; Morocco; 1924–26; E; Brown (1984), Clausen (1978)
	– *kuvanae*; Portugal; 1932; E; Brown (1984), Clausen (1978)
	– *kuvanae*; Spain; 1923–27; E; Brown (1984), Clausen (1978)
	– *kuvanae*; USA; 1908–28, 1967–1971, 1981; E; Brown (1984), Peck (1963), Clausen (1956, 1978), Coulson *et al.* (1988)
	– *kuvanae*; CIS; 1987; ?; Volkov & Mirohova (1990)
	– *kuvanae*; Yugoslavia; ?1960; ?; Brown (1984)
Othreis fullonia	– sp. (?= *papilionis*); American Samoa; ?; ?; Waterhouse & Norris (1987)
	– sp. (?= *papilionis*); Western Samoa; ?; ?; Waterhouse & Norris (1987)

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SYSTEMATIC SECTION

OOENCYRTUS Ashmead

Ooencyrtus Ashmead, 1900: 381. Type species: *Encyrtus clisiocampae* Ashmead, by original designation.

Echthrodryinus Perkins, 1906: 252. Type species:

Echthrodryinus destructor Perkins, by monotypy. Synonymy with *Ooencyrtus* by Noyes & Hayat, 1984.

Ectopiognatha Perkins, 1906: 254. Type species: *Ectopiognatha minor* Perkins, by designation of Gahan & Fagan, 1923: 49. **Syn.nov.**

Schedius Howard, 1910: 2. Type species: *Schedius kuvanae* Howard, by original designation. Synonymy with *Ooencyrtus* by Ferrière, 1931.

Tetracnemella Girault, 1915: 170. Type species: *Tetracnemella australiensis* Girault, by original designation. Synonymy with *Ooencyrtus* by Noyes & Hayat, 1984.

Xesmatia Timberlake, 1920: 424. Type species: *Xesmatia flavipes* Timberlake, by original designation. Synonymy with *Ooencyrtus* by Noyes & Hayat, 1984.

Pseudolitomastix Risbec, 1954: 1068. Type species: *Litomastix creona* Risbec. Synonymy with *Ooencyrtus* by Annecke & Mynhardt, 1973.

Comments on generic synonymy

Species previously combined with the genus *Ectopiognatha* can be separated from *Ooencyrtus* by the quadridentate mandibles and a broadened and flattened scape. However, one of the species included in this revision (*leander* sp.n.) is extremely close in general structure to both species included in *Ectopiognatha* except that it has a cylindrical scape. In addition, several described species of *Ooencyrtus* have a scape which is distinctly broadened. The biology of *Ectopiognatha* spp. (parasitoids of the eggs of Hemiptera) falls within the range of that found in *Ooencyrtus* (see below) and, therefore, we have no hesitation in treating the two genera as synonymous.

Noyes and Hayat (1984) treated *Echthrodryinus* as a synonym of *Ooencyrtus* whilst Gordh & Trjapitzin (1978) and later Trjapitzin (1989) have treated it as valid. It is not possible to separate the two genera on morphological grounds and the only possible basis for continuing to treat them as distinct is that the included species have different biologies. *Ooencyrtus* could be restricted to primary parasitoids (or perhaps hyperparasitoids) of the eggs of various insects, whilst *Echthrodryinus* could include primary parasitoids or hyperparasitoids of the larvae or prepupal stages of certain holometabolous insects, e.g. Dryinidae, Braconidae and Gracillariidae. However, one species, *Ooencyrtus kuvanae*, has been recorded both as a primary parasitoid of the eggs of gypsy moth (*Lymantria dispar*) and as a hyperparasitoid of the prepupal and pupal stages of the braconid *Apanteles melanoscelus* in their cocoons after they emerge from their gypsy moth caterpillar host (see below). Recent work (Noyes, 1985 and Prinsloo, 1987) has shown that the host range of *Ooencyrtus* spp. is much more diverse than had previously been thought, many species being noted as parasitic on nymphs of Aphididae (Hemiptera) and Syrphidae (Diptera), even to the extent where specimens that attack dipterous or coleopterous larvae are morphologically indistinguishable from those that attack heteropterous eggs (see Noyes, 1985). In view of this, we are continuing to treat *Echthrodryinus* as synonymous with *Ooencyrtus*.

Generic diagnosis

In the most comprehensive classification of the Encyrtidae currently available, Trjapitzin (1973, 1989) includes *Ooencyrtus* in the Encyrtinae, tribe Microteryini, subtribe Ooencyrtina. Unfortunately, this classification does not provide any meaningful diagnoses for the tribes or subtribes. We are therefore hopeful that the following diagnosis will enable species to be assigned correctly to *Ooencyrtus*:

> Robust, squat species, never conspicuously slender and elongate; thorax with posterior margin of mesoscutum weakly to strongly convex medially and overlying axillae centrally so that when thorax is in normal resting position axillae appear to be widely separated; mesopleuron posteriorly expanded so that it touches base of gaster, or nearly so, and completely conceals the metapleuron and propodeum from lateral view immediately above the hind coxae; forewing with marginal vein punctiform or not much longer than broad,

Species of *Ooencyrtus* can be most easily confused with *Trichomasthus*, *Helegonatopus* and *Psyllaephagus*. Both *Helegonatopus* and *Psyllaephagus* have the mesopleuron normal, not expanded posteriorly and not touching the base of the gaster so that in lateral view the metapleuron and propodeum are not obscured and touch the hind coxae. Species of *Trichomasthus* are generally much larger, usually being about 1.5 mm long, the marginal vein of the forewing is normally several times longer than broad, and all species are parasitoids of scale insects (Coccoidea).

Superficially, the placement of the genus within the tribe Microteryini may appear somewhat questionable, especially on biological grounds. Morphologically, it is possibly to see an evolutionary trend from a *Microterys*-like or *Trichomasthus*-like ancestor, some species of *Microterys* and *Trichomasthus* being quite similar

structurally and, as stated above, it can be sometimes quite difficult to separate *Ooencyrtus* from *Trichomasthus*. If it is hypothesized that the plesiomorphic host association for the tribe is scale insects (Homoptera; Coccoidea) (see Trjapitzin, 1989) then it would be possible to envisage a switch from parasitising insects with hard a scale covering and a host immune system, to parasitising the eggs of other insects which have a hard outer shell and no immune system. A further switch to hyperparasitism of Braconidae or Dryinidae, or parasitism of the immature stages of holometabolous insects (Diptera and Lepidoptera) is much more difficult to envisage, but at least two species are known to parasitise both hemipterous or lepidopterous eggs and the prepupae or pupae of holometabolous insects, i.e. *kuvanae* (Muesebeck & Dohanian, 1927) and *submetallicus* (see Noyes, 1985).

Systematic relationships within the genus

The relationships within *Ooencyrtus* are unclear and we do not attempt to provide any sort of formal classificatory framework within the genus by proposing subgeneric categories. However, probable assemblages of closely related species within the genus are highlighted in the comments sections of the appropriate species.

Identification of species

The following works should be consulted as aids to the identification of species from outside the Oriental region: Peck (1963) and Gordh (1979) for North America; Noyes (1985) and De Santis (1988) for South America; Trjapitzin (1989) for the Palaearctic; Prinsloo (1987) for Africa.

Previous work dealing with the species within the Indo-Pacific area has not much value, either because of inadequate coverage of the species, or because it relies on poor characters whilst overlooking important diagnostic features. The only key available (Trjapitzin *et al.*, 1978) is based almost entirely on inadequate original descriptions and is therefore of little use.

Although we describe males of each species when they are available, they are excluded from the key to species. Males are often difficult to identify because they do not present many features and are unknown for most of the species included here. However, the presence of males in a reared series may help to confirm the separation of some closely related species, e.g. *sphingidarum* and *papilionis*.

During the course of this work we have found the following characters especially helpful in identifying species:

Mandibles – several basic types, a) with one tooth and a broad straight, sometimes minutely denticulate truncation (Figs 10, 18, 139, 188, 204, 333, etc.), b) with one tooth and a broad, slightly convex, minutely denticulate truncation (Figs 303), c) one tooth and a distinctly emarginate truncation, or with two teeth and a truncation (Figs 75, 143, 150, etc.), d) tridentate (Fig. 69, 91, 268, etc.), all teeth subequal, e) one or two teeth and an oblique minutely denticulate truncation, (Fig. 240), f) three acute, unequal teeth (Fig. 176), or g) four teeth (Fig. 46).
Clava – a) clava with apex rounded and sensory area at extreme apex only (Figs 42, 47, 51, etc.) b) clava with sutures transverse and parallel, apex obliquely truncate and sensory area enlarged (Figs 9, 104, 196, etc.), or c) clava with sutures oblique, apex obliquely truncate and sensory area enlarged (Figs 16, 22, 28, 193, etc).
Eyes – a) conspicuously hairy, or b) almost naked.
Ocelli – relative distance of ocelli from occipital margin in terms of their own diameters.
Antennal toruli – relative distance below eyes or above mouth margin in terms of their own lengths.
Interantennal prominence – coloration purple or metallic green or blue green, etc.
Scutellum – relative depth and type of sculpture in relation to mesoscutum.
Forewing – relative density and distribution of setae on both dorsal and ventral surfaces of basal cell and on ventral surface of costal cell; linea clava closed or open; relative length of marginal and postmarginal veins in relation to stigmal.
Legs – the coloration of coxae, femora and tibia seems to be reliable although there may be a slight amount of variation in the intensity of any brown areas on the femora and tibia. The coloration of the fore and hind coxae may vary from yellow to largely brown in some species.
Gaster – the relative length may be unreliable because it may depend on the preservation techniques used. In air dried specimens the gaster collapses and may thus be relatively shorter than in Critical Point Dried specimens where the gaster remains inflated (see Gordh & Hall, 1976). The shape of the last tergite (apically rounded, truncate or medially invaginated) may be useful as well as the shape of the hypopygium (rectangular, triangular, with long or short anterior lateral projection, relative size of posterior incision, distribution and relative density of setae).

Ovipositor – other than the usual characters such as relative length of the gonostyli or overall length of the ovipositor in relation to the mid tibia we have found that the shape of the proximal part of the second valvifer can be extremely useful (e.g. compare upper parts of Figs 225 and 226). The length of the ovipositor is here taken as the combined length of the second valvifer together with the third valvula (gonostylus).

Abbreviations used in text

F1, F2, etc. – First funicle segments, second funicle segment, etc.
OOL – Ocular-ocellar line, or the shortest distance between each posterior ocellus and the adjacent eye margin.
POL – Posterior ocellar line, or the shortest distance between the two posterior ocelli.

Key to Oriental species of Ooencyrtus (females)

1 At least one pair of coxae black or brown, concolorous with mesopleuron; gaster entirely black or brown without any yellow or orange areas 2

— All coxae yellow (occasionally fore coxae slightly infuscate); gaster frequently yellow or orange in part, although often entirely black or brown 33

2(1) All coxae and femora conspicuously black or brown (rarely femora yellow with inconspicuous brown markings but if so then clava has a broad, slightly oblique apical truncation, the funicle segments are quadrate or transverse, the scape is subcylindrical (Fig. 9) and the scutellum has relatively shallow sculpture basally (Fig. 12)) 3

— Not all coxae and femora black or brown, at least some of them yellow (clava usually with apex rounded but if with a distinct, slightly oblique apical truncation, then either some funicle segments are clearly longer than broad, or the scape is strongly flattened and only about 2.5 times as long as broad (Fig. 104), or the scutellum has deep punctate-sculpture basally (as in Fig. 109)) 20

3(2) Antenna (Figs 1, 9, 16, 22, 28, 34) with clava robust and with a large sensory apical area which gives it a distinct transversely or obliquely truncate appearance 4

— Antenna (Figs 37, 42, 47, 51, 54, 59, 64, 67, 68, 76, 83) with clava normally comparatively slender and with only a small apical sensory area which gives it a rounded or even pointed appearance 9

4(3) Sensory part of clava less than one third length of clava (Figs 1, 4, 9) 5

— Sensory part of clava more than one-third length of clava (Figs 16, 22, 28, 34) 6

5(4) Mesoscutum with numerous silvery setae; scutellum conspicuously reticulate throughout (Fig. 2); [fore-tibia of male characteristic (Fig. 7)] ..... *guamensis* (p. 16)

— Mesoscutum without silvery setae; posterior half of scutellum smooth (Fig. 12) ... *acca* (p. 17)

6(4) Antenna with first funicle segment at least 1.5 times as long as broad and at least a little longer than sixth (Fig. 16) .... *phongi* (p. 18)

— First funicle segment not, or hardly, longer than broad and shorter than sixth (Figs 22, 28, 34) . 7

7(6) Frontovertex more than one-fifth head width; gaster apically acute with ovipositor exserted, the exserted part about as long as mid tibial spur; mandibles tridentate ..... *acus* (p. 19)

— Frontovertex less than one-fifth head width; gaster apically truncate with ovipositor more or less hidden; mandibles with one small tooth and a very broad truncation 8

8(7) Scutellum with apical one-third smooth and very shiny ..... *caurus* (p. 21)

— Reticulate sculpture of scutellum extending almost to posterior margin with only a very narrow smooth and shiny marginal strip- ..... *lucens* (p. 22)

9(5) Forewing with linea calva closed posteriorly (Figs 38, 40); antenna with all funicle segments longer than broad (Fig. 37) 10

— Either linea calva open posteriorly (Figs 44, 48, 53, 55, 60, 65, 70, 77) or antenna with some segments quadrate or transverse (Figs 42, 83) 11

10(9) Flagellum bicolorous, funicle segments brown or testaceous, clava yellow .. *minerva* (p. 22)

— Flagellum unicolorous ..... *icarus* (p. 23)

11(9) Scutellum anteriorly with shallow, indistinct sculpture, the posterior part smooth; frontovertex at least one-third head width (Figs 43, 45); mandibles (Fig. 46) with four teeth; ovipositor exserted, the exserted part at least one-quarter as long as gaster 12

— Scutellum with conspicuous, raised, regular reticulations, only margin narrowly and sometimes apex smooth (Figs 71, 80); frontovertex

normally distinctly less than one-third head width; mandibles tridentate (Figs 56, 74, 85) or with one or two teeth and a truncation (Figs 69, 75); ovipositor not exserted, but if so then exserted part less than one-fifth length of gaster 13

12(11) Antenna (Fig. 42) with F1–4 subequal and clearly smaller than F5–6, clava as long as F3–6; exserted part of ovipositor half to one-third gaster length ..... *adonis* (p. 24)

— Antenna (Fig. 47) with F1 the smallest and much smaller than F2–6 which are subequal in size, clava about as long as F4–6; exserted part of ovipositor about one-quarter as long as gaster ..... *aeneas* (p. 25)

13(11) Visible part of ovipositor sheaths white, yellow or amber and extending past apex of last tergite, although occasionally hardly so ... 14

— Visible part of ovipositor sheaths brown to dark brown, frequently not extending past apex of last tergite 15

14(13) Reticulate sculpture of scutellum relatively shallow and hardly deeper than that on mesoscutum, especially in apical half or so; mid femur and tibia hardly marked with brown, almost completely yellow; eye with conspicuous translucent setae ..... *phoebi* (p. 26)

— Reticulate sculpture of scutellum clearly deeper than that on mesoscutum except on sides an extreme apex; mid femur and tibia mostly dark brown; eye almost naked, with setae very short and inconspicuous ..... *kuvanae* (p. 26)

15(13) Scutellum uniformly bright green and with deep, more or less regular reticulate sculpture; mandibles with three acute teeth . *dis* (p. 27)

— Scutellum green only at sides and apex, otherwise blue, purple or coppery and relatively dull with sculpture elongate-reticulate or striate towards sides; mandibles with one or two teeth and a truncation (Figs 69, 75) 16

16(15) Frontovertex about one-third head width (Fig. 62) ..... *hercle* (p. 28)

— Frontovertex not more than one-quarter head width (Fig. 74, 85) 17

17(16) Clava relatively short, only about as long as F4–6 combined (Fig. 64) ..... *corbetti* (p. 29)

— Clava at least as long as F3–6 combined ... 18

18(17) Mid and hind tibiae completely yellow, without a brown subbasal ring . *podontiae* (p. 30)

— Mid and hind tibiae each with a narrow brown subbasal ring 19

19(18) Eye as broad as long or broader; antennae (Fig. 76) with F1–2 subequal in size and smaller than F3–6 ..... *pindarus* (p. 30)

— Eye distinctly longer than broad; antennae (Fig. 83) with F1–3 subequal in size and conspicuously smaller than F4–6 . *plautus* (p. 31)

20(2) Scutellum entirely smooth and shiny except for a small sculptured triangular area posterior to axillae, this extending less than half way along scutellum (Fig. 105); hypopygium reaching apex of gaster; gaster almost always with extensive yellow areas 21

— Scutellum more extensively sculptured with sculpture discernible in apical half (Figs 106, 109, 146); hypopygium never reaching apex, generally not reaching two-thirds along gaster; gaster without any yellow areas 23

21(20) Forewing with a transverse fuscous band from marginal vein (Fig. 90); all coxae black-brown ..... *daphne* (p. 33)

— Forewing completely hyaline (Figs 98, 99); at least hind coxae yellow ..... *flavipes* (p. 34)

22(20) All coxae black or dark-brown 23

— Fore-coxae yellow 30

23(22) Scape strongly broadened and flattened, only about 2.5 times as long as broad; antennae strongly clavate with club extremely large (Fig. 104) ..... *dione* (p. 34)

— Scape subcylindrical, at least about 4 times as long as broad; antenna not strongly clavate and with club of normal proportions, not conspicuously enlarged (Figs 108, 113, 120, 125, 126, 129, 134, 141, 142, 148) 24

24(23) Forewing with a median fuscous band (Fig. 107); antennae white except for radicle . *dryas* (p. 35)

— Forewing hyaline; antennae testaceous or brown, not white 25

25(24) Scutellum with relatively deep punctate-reticulate sculpture over more than half of its surface, this conspicuously deeper than sculpture of mesoscutum (Fig. 109) 26

— Sculpture of scutellum not deeply punctate and generally not deeper than that on mesoscutum, but if so then deeper sculpture present only in basal one-third or less 27

26(25) Clava paler than funicle, except perhaps F6; all funicle segments longer than broad, funicle clearly longer than scape and radicle together (Fig. 108) ..... *ceres* (p. 36)

— Clava concolorous with funicle or darker; at least four funicle segments quadrate or transverse, funicle shorter than scape and radicle together (Fig. 113) ..... *ilion* (p. 37)

27(26) Ovipositor sheaths yellow or pale orange, usually protruding very slightly past apex of last tergite of gaster 28

— Ovipositor sheaths dark brown, occasionally completely hidden by last tergite of gaster . 29

28(28) Antennae relatively slender, the pedicel and flagellum together longer than head width and apical funicle segments longer than broad (similar to Fig. 108); fore tibiae yellow marked with pale brown ..... *iris* (p. 38)

— Antennae clavate, the pedicel and flagellum together shorter than head width and apical funicle segments transverse or quadrate (Fig. 120); fore tibiae almost entirely black or very dark brown ..... *javanicus* (p. 39)

29(28) Frontovertex not, or hardly, more than about one-quarter head width (Fig. 127); ventral surface of costal cell with only one complete row of stout setae (Fig. 128); dorsum of thorax moderately metallic with contrasting blue, green or purple areas ..... *iulus* (p. 40)

— Frontovertex about one-third head width (Fig. 132); ventral surface of costal cell with two or three complete rows of fine setae (Fig. 130); dorsum of thorax uniform dull green or greenish blue without any strongly contrasting purple areas ..... *ixion* (p. 40)

30(22) Scutellum with at least posterior one-fourth smooth and shiny 31

— Scutellum with less than posterior one-fifth smooth and shiny 32

31(30) Anterior half of scutellum with regular raised reticulations, posterior half smooth and mirror-like; ocelli forming an angle of only slightly less than 90°; posterior femora mostly yellow but dorsally with a very narrow dark brown edge; ovipositor sheaths yellowish; mandibles with one obtuse small tooth and a broad truncation which bears five or six minute denticles (Fig. 137) ..... *elissa* (p. 42)

— Anterior three-quarters of scutellum elongately reticulate, posterior one-quarter smooth; ocelli very nearly forming an equilateral triangle; posterior femora mostly brown; ovipositor sheaths dark brown; mandibles without denticles on the truncate part (Fig. 139) ..... *egeria* (p. 43)

32(30) All femora yellow, mid and hind coxae dark brown; scutellum reticulate except for a posterior mirror-like portion which is clearly delimited posteriorly by a sharply impressed line (Fig. 146) ..... *erebus* (p. 44)

— Hind femora at least partly brown, mid coxae more or less yellow; scutellum reticulate but without a clearly delimited mirror-like posterior portion ..... *endymion* (p. 45)

33(1) Gaster completely black, without any yellow or orange areas 34

— Gaster partly yellow or orange, at least basally yellowish in ventral view 51

34(33) Thorax with yellow or orange areas 35

— Thorax completely dark, without any yellow or orange areas 36

35(34) Clava slightly enlarged, clearly broader than funicle (Fig. 154) and truncated at apex with a conspicuous sensory area; mesoscutum with at least anterior margin orange; axillae orange; body larger (1.35 mm.) ..... *hymen* (p. 47)

— Clava not conspicuously enlarged and hardly broader than F6 (Fig. 160), its apex rounded and without a conspicuous sensory area; mesoscutum and axillae totally blue-green; body smaller (less than 1 mm.) . *belus* (p. 48)

36(34) Scutellum with at least posterior one-fifth smooth and shiny 37

— Scutellum completely reticulate except for a very narrow marginal strip 41

37(36) Flagellum bicolorous, clava yellow or pale yellow and contrasting with the brown to dark brown funicle segments 38

— Flagellum unicolorous, testaceous to dark brown 39

38(37) Scape yellowish and clearly paler than funicle; F4–6 quadrate or transverse; clava as long as F4–6 together (Fig. 167); forewing hyaline ..... *bacchus* (p. 49)

— Scape very dark brown and concolorous with funicle; F4–F6 longer than broad; clava as long as F3–F6 together (Fig. 169); forewing usually infuscate below marginal vein ... *pacificus* (p. 50)

39(37) Frontovertex about one-third head width; antenna with F1 transverse and much smaller than F2–5 which are also transverse (Fig. 175) ..... *larvarum* (p. 50)

— Frontovertex about one-fifth head width; antenna not with F1 conspicuously smaller than those that follow and at least some funicle segments longer than broad (Figs 181, 187) 40

40(39) Ovipositor sheaths yellow; forewing (Figs 182, 184) with marginal vein punctiform ..... *pallidipes* (p. 51)

— Ovipositor sheaths brown; forewing (Fig. 189) with marginal vein distinctly longer than broad ..... *pilosus* (p. 52)

41(36) Sensory part of clava extensive and occupying

an area at least two-fifths as long as clava itself giving the clava a strongly transversely or obliquely truncate appearance, sutures often distinctly oblique (Figs 190, 193, 196, 202) 42

— Sensory part of clava relatively small and occupying an area not more than one-fifth as long as clava, apex of clava varying from rounded to pointed and sutures never oblique (Figs 206, 208, 212, 221, 227) 45

42(41) Ovipositor not more than about one-third longer than mid tibia and not exserted, the gonostyli not longer than mid tibial spur and yellowish if visible externally 43

— Ovipositor at least twice as long as mid tibia and clearly exserted past apex of last tergite, the gonostyli about twice as long as mid tibial spur and at least partially dark brown 44

43(42) Legs completely yellow; eyes more or less naked, with short, sparse setae; frontovertex about one-third head width and posterior ocelli separated from eye margins by about their own diameters ..... *valcanus* (p. 53)

— Legs with small areas of dark brown near apices of femora and bases of tibiae; eyes conspicuously hairy, even at low magnifications; frontovertex not more than about one-quarter head width and posterior ocelli more or less touching inner eye margins . *urania* (p. 54)

44(42) Antenna (Fig. 196) with all funicle segments, except F6, subquadrate or even distinctly longer than broad so that pedicel and flagellum together are as long as head width; scutellum with regular punctate-reticulate sculpture in anterior two-thirds or so .. *vertumnus* (p. 55)

— Antenna (Fig. 202) with all funicle segments, except F1, strongly transverse so that pedicel and flagellum together are distinctly shorter than head width; scutellum with relatively shallow reticulate sculpture anteriorly .. *vesta* (p. 56)

45(41) Forewing (Fig. 207) infuscate below apex of venation; tegulae yellow ..... *boreas* (p. 57)

— Forewing hyaline; tegulae dark brown 46

46(45) Interocellar area very slightly to strongly raised above rest of vertex (Figs 210, 215), sculpture in this area conspicuously rougher than below anterior ocellus, if interocellar area hardly raised (Fig. 216) then ovipositor sheaths are brown and clearly darker than hind tibia; clava pale yellow and at least a little paler than funicle 47

— Interocellar area not raised (Figs 219, 224), sculpture similar to that below anterior ocellus, or if distinctly rougher, then ovipositor sheaths honey yellow and more or less concolorous with hind tibia; flagellum varying from white to brown but all segments concolorous 48

47(46) Antenna with F6 transverse (Fig. 208); posterior ocelli separated from occipital margin by about 2.5 times their own lengths; scutellum convex and dull metallic green slightly mixed with coppery towards base ..... *clio* (p. 58)

— Antenna with F6 longer than broad (Fig. 212); posterior ocelli separated from occipital margin by about 1.5 times their own lengths; scutellum fairly flat and uniformly bright metallic green or blue-green ..... *circe* (p. 59)

48(46) Antennae, excluding radicle, completely white or very pale yellow ..... *clotho* (p. 60)

— Antennae varying from testaceous yellow to brown 49

49(48) All funicle segments longer than broad (Fig. 221); postmarginal vein of forewing very short, less than one-third as long as stigmal vein (Fig. 222); mandible with a very broad truncation with is minutely serrate ..... *cybele* (p. 61)

— Antennae at least with F1–2 quadrate or transverse (Fig. 227); postmarginal vein at least half as long as stigmal; truncate part of mandibles not minutely serrate 50

50(49) Scutellum quite shiny and green to greenish-blue particularly in its apical half, anterior part slightly coppery; mandibles with two acute teeth and a truncation; ovipositor (Fig. 226) about 1.5 times as long as mid-tibia and always a little exserted ..... *ooii* (p. 62)

— Scutellum relatively dull, mostly black with a purple tinge, its extreme margins metallic green, blue or purple; mandible with one tooth and a truncation (or at least second tooth very short and strongly obtuse); ovipositor about one-third longer than mid-tibia and usually hidden ..... *crassulus* (p. 63)

51(33) Thorax mostly or entirely orange 52

— Thorax without any orange areas 53

52(51) Head orange and mesopleura orange ..... *lucina* (p. 63)

— Head metallic green, mesopleura mostly brown ..... *macula* (p. 64)

53(52) Antenna with F1 transverse and conspicuously smaller than other funicle segments which are subequal in size and subquadrate (Fig. 242); mandible unique with one relatively long tooth and an oblique, denticulate truncation (Fig. 240) ..... *hera* (p. 65)

— Antenna otherwise, with proximal funicle segments subequal, F1 not or conspicuously smaller than F2 and frequently much longer than broad (Figs 250, 251, 256, 262, 270, 275, 277, 282, 287, 297, 300, 304, 308, 317–319, 329); mandibles either tridentate or with one tooth and a truncation (Figs 248, 268, 283, 290, 303, 333, 334) . 54

54(53) Mandibles apically relatively narrow and with three acute teeth, the upper tooth occasionally clearly shorter and hardly acute (Figs 248, 268, 283) 55

— Mandibles relatively broad, with one tooth and a broad truncation (Figs 290, 303, 333, 334 and as in figs 121 and 139) 62

55(54) Frontovertex more than one-quarter head width (Figs 247, 255, 260) 56

— Frontovertex (less than one-quarter head width (Fig. 280) 58

56(55) Antennae (Figs 250, 251) with funicle segments subquadrate or longer than broad so that clava is about as long as F3–6 together, pedicel and flagellum together longer than head width; tegulae usually conspicuously yellow or orange basally ..... *manii* (p. 67)

— Antennae (Figs 256, 262) with most or all of the funicle segments transverse so that clava is as long as funicle or nearly so, pedicel and flagellum together shorter than head width; tegulae entirely brown 57

57(56) Ovipositor exserted, the exserted part at least as long as the mid tibial spur; last tergite apically convex, rounded ..... *midas* (p. 68)

— Ovipositor not or hardly exserted; last tergite with a characteristic V-shaped apical emargination ..... *mars* (p. 69)

58(55) Antenna with F6 longer than broad; clava with sutures parallel, its apex rounded and sensory part relatively small and limited to extreme apex only ..... *neptunus* (p. 70)

— Antenna (Fig. 270) with F6 transverse; clava with sutures at least slightly, but distinctly convergent, the sensory part enlarged generally giving the clava an obliquely truncate appearance 59

59(58) Mesopleuron orange ..... *libitina* (p. 71)

— Mesopleuron dark brown or black 60

60(59) Antenna (Fig. 275) with clava as long as F3–6 together; forewing (Fig. 276) with a conspicuous group of setae in basal cell on ventral surface close to and running parallel with posterior wing margin ..... *lyaeus* (p. 72)

— Antenna with clava as long as five preceding funicle segments together (Figs 277, 282); forewing (Fig. 278) without a conspicuous group of setae on ventral surface of basal cell near posterior wing margin 61

61(60) Clava brown, contrasting with the yellow funicle; last segment of clava occupying about two thirds length of clava (Fig. 277) ..... *lupercus* (p. 73)

— Clava and funicle concolorous, pale yellow; last segment of clava occupying only slightly more than half length of clava (Fig. 282) ..... *maenas* (p. 74)

62(54) Frontovertex distinctly wider than one-quarter head width (Figs 286, 296); scutellum with shallow reticulate sculpture which is hardly deeper than that on mesoscutum (Figs 288, 289) 63

— Frontovertex not wider than one-quarter head width (Figs 312, 314, 315); sculpture on scutellum frequently punctate-reticulate, especially in basal half and conspicuously deeper than that on mesoscutum (Figs 309, 316) 64

63(62) Distal funicle segments distinctly longer than broad, normally about twice as long as broad (Fig. 287); pedicel and flagellum together much longer than head width; macropterous and brachypterous forms known . *segestes* (p. 75)

— Distal funicle segments hardly longer than broad (Fig. 297); pedicel and funicle together not or hardly longer than width of head; only macropterous forms known .. *ferrierei* (p. 75)

64(62) Scutellum basally with relatively shallow sculpture (Fig. 305) which is not, or hardly, deeper than that on mesoscutum 65

— Scutellum, at least in basal half, with deep punctate-reticulate or striate-reticulate sculpture (Fig. 309, 316) which is clearly much deeper than that on mesoscutum 66

65(64) Ovipositor at least slightly exserted, sheaths yellow; mandibles with three short teeth and a truncation armed with three or four denticles (Fig. 303) ..... *leander* (p. 76)

— Ovipositor hidden, sheaths black or dark brown; mandibles with one tooth and a truncation armed with numerous very fine, minute denticulae ..... *musa* (p. 77)

66(64) Basal two-thirds of scutellum with more or less striate reticulate sculpture, especially laterally (Fig. 309); mesoscutum bright metallic green and clothed with conspicuous silvery setae; all funicle segments clearly longer than broad (Fig. 308) ..... *telenomicida* (p. 78)

— Basal half or two-thirds of scutellum with fairly regular punctate-reticulate sculpture (Fig. 316); mesoscutum sometimes bright metallic green but setae dark brown, occasionally trans-

lucent, but never silvery and conspicuous; usually one or two funicle segments quadrate or transverse (Figs 317–319), but occasionally all funicle segments clearly longer than broad (Figs 329, 331) 67

67(66) Funicle with at least two segments quadrate or conspicuously smaller than those that follow (Figs 317–319); ovipositor at least one-quarter longer than mid tibia with sheaths yellow or pale brown and about as long as basal tarsal segment of hind leg 68

— Either all funicle segments longer than broad and gradually enlarging distad (Figs 329, 331), occasionally F1 relatively smaller than F2, or ovipositor not longer than mid tibia with sheaths dark brown or black and conspicuously shorter than basitarsus of hind leg 69

68(67) Scutellum relatively narrow, not more than about 1.3 times as broad as long [longest setae on male flagellum at least about 3 times as long as diameter of segments (Fig. 328)] ..... *papilionis* (p. 79)

— Scutellum relatively broad, about 1.5 times as long as broad [longest setae on male flagellum not more than 1.5 times as long as diameter of segments, mostly much shorter (similar to Fig. 337)] ..... *sphingidarum* (p. 81)

69(67) Ovipositor sheaths yellow; tegulae with at least base yellow ..... *shakespearei* (p. 81)

— Ovipositor sheaths and tegulae completely dark brown or black ..... *utetheisae* (p. 81)

Review of species

Ooencyrtus guamensis Fullaway

(Figs 1–8)

Ooencyrtus guamensis Fullaway, 1946: 205. Holotype , Guam (USNM, examined).

Schedius garouae Risbec, 1954: 896–899. ?Lectotype , Camerouns (?MNHN, not examined). **Syn. n.**

Psyllaephagus goarini Risbec, 1958: 98. LECTOTYPE (here designated), Madagascar (MNHN, examined). **Syn.n.**

Ooencyrtus garouae (Risbec); Annecke & Insley, 1971: 20, 39.

DIAGNOSIS. Mandibles with one tooth and a broad truncation; mesoscutum with conspicuous silvery hairs; forewing (Fig. 3) with postmarginal vein extremely short, basal naked area small and open posteriorly; scutellum with deep punctate-reticulate sculpture, laterally elongate and extreme apex and sides smooth and shiny (Fig. 2); gaster blackish without yellow or orange areas. Female (Length 1.05–1.45 mm): all coxae and most part of femora dark brown or black, concolorous with mesopleuron; axillae dark brown; antennal scape relatively densely hairy; clava with a short oblique apical truncation (Figs 1, 4); F6 subquadrate or a little transverse, other funicle segments usually slightly longer than broad; frontovertex one-quarter head width; hypopygium with anterior margin straight (Fig. 5). Male (0.79–1.03 mm): legs, including coxae, yellow; axillae largely yellow; antennae as in Fig. 6; frontovertex about two-fifths head width; genitalia as in Fig. 8; fore tibia with a characteristic, minutely scaled, elongate depression in its apical half (Fig. 7).

HOSTS. This species is a pupal parasitoid of Syrphidae (Diptera). It is recorded below from *Paragus auritus*, *Asarkira pura*, *Ischiodon scutellaris*; from Africa (see also Prinsloo, 1987) as a parasitoid of *Ischiodon aegyptius* feeding on *Aphis craccivora*, of *Paragus borbonicus* feeding on *Dactynotus compositae*, of *Ischiodon aegyptius* on cotton; and from Hawaii as a parasitoid of *Allograpta exotica* (Beardsley, 1976). The records (below) from a coccinellid pupa, from an aphid and from caterpillars of *Mythimna (=Pseudaletis) unipuncta* and *Exelastis atomosa* (Lepidoptera: Noctuidae) are probably erroneous due to incorrect host associations or identifications.

DISTRIBUTION. Africa, India, Burma, Thailand, Philippines, P. R. China, Malaysia, Indonesia, Papua New Guinea, Fiji, Micronesia, Hawaii.

MATERIAL EXAMINED. Type material. Holotype ♀ (*Ooencyrtus guamensis*), GUAM: Piti, ex. syrphid puparium, 15.ix.1936 (O. H. Swezey). Paratypes, 1♀, 1♂, same data as holotype (USNM). Syntypes of *Psyllaephagus goarini* Risbec: 6♀ labelled '*Psyllaephagus goarini* Goarin AL366 Lac Alotra', all originally on slides (MNHN). Three subsequently remounted on cards and the one labelled 'LT♀' on underside of card is here designated LECTOTYPE.

Other material. INDIA: 3♀, Delhi, New Delhi, ex. pupa of coccinellid, 1958, C.I.E. coll. No.16082; 3♀, 1♂, Delhi, IARI area, x.1979 (Z. Boucek); 1, Uttar Pradesh, Aligarh, 8–10.xi.1979 (J. S. Noyes); Uttar Pradesh, Dehra Dun, x.1979 (Z. Boucek); 18♀, 6♂, Dehra Dun, 2,300ft. ex. syrphid pupa, 4.xi.1935/14.xi.1935 (J. A. Graham); 2♀, 2♂, Rajasthan, Udaipur, ex. larva of *Pseudaletia unipuncta* (Haworth), 30.ix.1972, C.I.E. A6944; 3♀, 2♂, Rajasthan, Udaipur, ex. *Pseudaletia unipuncta* (Haworth), 30.ix.1973,

C.I.E. A6602; 1♀, Andhra Pradesh, Hyderabad, Patancheru, ICRISAT, vii.–ix.1980, M. trap, (Bernays & Woodhead); 4♀, Maharashtra, Poona, ex. moth *E. atomosa*, C.I.E.1474, 26.viii.1966; 4♀, Karnataka, Bangalore, 19–23.ix.1979 (J. S. Noyes); 2♀, Karnataka, Bangalore, xi.1979 (Z. Boucek); 1♀, Karnataka, Bangalore, ii.1980 (K.D. Ghorpade); 3♀, Karnataka, Bangalore, 916m, ex syrphid pupa, 28.ii.1979 (K. D. Ghorpade); Karnataka, Mudigere, 26.x–4.xi.1979 (J. S. Noyes); 1♂, Karnataka, 25km. W. of Mudigere, 28.x.–3.xi.1979 (J. S. Noyes); 1♀, Karnataka, Bangalore 916m. ex. syrphid pupa, xi.1971 (K. D. Ghorpade); 1♀, Karnataka, Bangalore 916m. ex syrphid pupa, 28.ii.1973 (K. D. Ghorpade); 3♀, Bangalore, ex *Paragus auritus* Stukenberg (det. K.D. Ghorpade, 1986), 14.vii.1986 (T.M. Mushtak Ali); 2♀, Tamil Nadu, Coimbatore, 7.xi.1979 (Z. Boucek); Tamil Nadu, Coimbatore, 25.ix–1.x.1979 (J. S. Noyes); 1♀, Tamil Nadu, Siruvani Forest, 30.ix.1979 (J. S. Noyes); 9♀, 5♂, ?Karnataka, Solapur, ex. aphid on safflower, CIE A20309, iv.1989. BURMA: 7♀, 1♂, Rangoon, 14.i.1988, CIE A19695. THAILAND: 2♀, Chieng Mai, 22.vii.–13.viii.1984 (D. Jackson); 1♀, Khao Val National Park, 10–12.ii.1989 (T. W. Thormin); 2♀, Huai Kha Khaeng, ii.1986 (M.G. Allen). P.R. CHINA: 1♀, Hainan, coastal vegetation, 19.v.1983 (Z. Boucek); 3♀, Hainan, Tie Fong Mts., 15.v.1983 (Z. Boucek); 1♀, 1♂, Hainan,. Tie Fong Mts., 15.v.1983 (Z. Boucek). MALAYSIA: 1♀, Sarawak, 4th div. Gn. Mulu, RGS Exp., 17.ix.–23.x.1977 (D. Hollis); 3♀, 3♂, Kuala Lumpur, ex pupa of *Asarkira pura*, v.1971 (T. H. Chua); PHILIPPINES: 1♀, Manila, ex syrphid pupa, 2.ix.1959 (C. R. Baltazar); 1♀, Manila, ex pupa of *Ischiodon scutellaris*, 2.ix.1959 (C. R. Baltazar). INDONESIA: 25♀, 6♂, Sulawesi Utara, Kotamobagu Danau Mooat, 1–6.v.1985 (J.S. Noyes); 2♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, 220m. vi.1985 (A. D. Austin); 9♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, 220m. 3.v.–6.vi.1985 (J. N. Noyes); 6♀, 1♂, Sulawesi, Utara, Dumoga-Bone NP, Toraut, 220m. iv.1985 (J. S. Noyes); 3♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, MT/YPT. v.1985 (J. S. Noyes); 2♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, 200m. ii.vii.1985. PAPUA NEW GUINEA: 3♀, Bulolo, Mt. Susu, 11.xii.1982 (Z. Boucek); 4♀, Bulolo, 13.xii.1982 (Z. Boucek); 1♀, Port Moresby, 20.xii.1982 (Z. Boucek); 4♀, 2♂, Madang Prov. Laing, 20.vi.1982 (P. Grootaert). FIJI: 1♀, Viti Levu Korottoongo, iii.1981 (N. L. M. Krauss). Material in BMNH.

Extralimital material. GHANA: 4♀, 3♂, with aphid on *Tecoma radicornis* Bignoniaceae, 17.ii.(19)69 em 27.ii.(19)69 (OWR [O.W. Richards]); 16♀, 3♂, same data but ex syrphid pupa, 25.ii em 1.iii.(19)69; KENYA: 5♀, 2♂, Nairobi-Chromo, ex syrphid pupa, iii.1970 (D. Kock); 3♀, 1♂, Kakamega, ex syrphid pupa on sorghum, 29.xii.1988 (H. van den Berg); P.R.CONGO: Brazzaville, ex syrphid pupa on cassava infested with *P. manihoti*, ?1988 (A. Biassangama); ZIMBABWE: 27♀, Chishawasha, various dates v.1980–iv.1981 (A. Watsham); ZAMBIA: 1♀, Lusaka, 15–24.iv.1980 (R.A. Beaver); Tanganyika (=TANZANIA): 23♀, 9♂, Nachingwea, ex *Ischiodon aegyptius* Wied. feeding on *Aphis craccivora* em iii.1954 (V.F. Eastop); 3♀, Nachingwea, ex *Paragus borbonicus* Macq. feeding on *Dactynotus compositae* Theobald (V.F. Eastop); SOUTH AFRICA, 17♀, 4♂, Transvaal, Berberton, ex puparium *Ischiodon aegyptius* on cotton, 1038, iii.1921 (G. Ulyett); MADAGASCAR: 2♀, Tulear, Berenty 12 Km NW Amboasary, 5–15.v.1983 (J.S. Noyes, M.C. Day) (compared with lectotype of *Psyllaephagus goarini* Risbec). Material in BMNH.

COMMENTS. We have not examined type material of *garouae* Risbec, but we have compared Oriental material with African material of *garouae* referred to by Prinsloo (1987) in his study of the Afrotropical species. We are confident that *garouae* is synonymous with *guamensis*.

Ooencyrtus guamensis can be separated from other species of *Ooencyrtus* by the following combination of characters: both female and male with mesoscutum covered by conspicuous silvery hairs, antennal scape relatively densely hairy (Figs 1, 4, 6), female antennal clava enlarged, obliquely truncate at apex (Figs 1, 4), male fore tibia with a characteristic, minutely scaled, elongate depression in its apical half (Fig. 7).

Ooencyrtus acca sp.n.

(Figs 9–15)

DIAGNOSIS. Female: all coxae black, femora normally at least with black or brown marks dorsally; antennae (Fig. 9) with all funicle segments transverse; clava conspicuously enlarged, with the sutures parallel and with an enlarged sensory area, its apex obliquely truncate; frontovertex about one-fifth head width; posterior ocelli nearly touching eye margin; scutellum anteriorly with shallow sculpture, the apical half

smooth (Fig. 12); ovipositor at least slightly exserted with gonostyli yellow.

FEMALE. Length 1.05–1.3 mm (holotype 1.3 mm).

Head dark metallic green, ocellar area mixed with purple, interantennal prominence mostly purple especially dorsally; antennae with radicle, scape along dorsal side proximally, dorsal part of pedicel, dorsal flagellum and clava testaceous; ventral sides of scape, pedicel and funicle segments yellow; pronotum, mesoscutum and axillae dark metallic green or blue mixed with purple; anterior half of scutellum with a dark purple-brown tinge, duller than mesoscutum, posterior half metallic blue mixed with purple; mesopleuron and propodeum black-brown to blackish; coxae and middle part of femora black-brown to blackish; trochanters, both ends of femora, tibiae and tarsi yellow, pretarsi brown; wings hyaline, venation testaceous; gaster dark brown to blackish with some metallic tinge; gonostyli yellow.

Head in ocellar area with fine, raised reticulations; reticulations on post-ocellar area transverse; face and genae more shiny than frontovertex, sculpture longitudinally elongate; ocelli forming an equilateral triangle; posterior ocelli separated from occipital margin by about 1.5 times their own lengths and nearly touching eye margins; frontovertex about one-fifth head width; eyes conspicuously hairy; occipital margin rounded; head in facial view slightly broader than high; antennae inserted far below ventral eye margins; clypeus with lower margin straight; antennae (Fig. 9) with all funicle segments subequal in length and distinctly transverse; clava clearly enlarged, about twice as long as broad, as long as F3–6 together; clava with sutures transverse and with apex obliquely truncate in lateral view, sensory area extensive but occupying less than one-third length of clava; mandibles with one tooth and a broad truncation (Fig. 10). Relative measurements (holotype): head width 48, head height 45, minimum frontovertex width 9, POL 3.5, OPL 6, OOL 0.2, eye length 30, eye width 26, malar space 18, scape length 21, scape width 5; other proportions of the antenna as in Fig. 9.

Mesoscutum with somewhat shallow transversely reticulate sculpture; scutellum (Fig. 12) slightly acute posteriorly, its anterior half with regular raised reticulate sculpture, posterior half smooth and shiny; forewing with venation and distribution of setae basally as in Figs 11 and 13, with conspicuous naked area basally which may be open or more or less closed posteriorly; linea calva open posteriorly; postmarginal vein less than half as long as stigmal vein. Relative measurements (holotype): forewing length 105, forewing width 46; hindwing length 72; hindwing width 18.

Gaster at most a little shorter than thorax; ovipositor (Fig. 14) slightly exserted, with gonostyli nearly one-third as long as ovipositor, and second valvifer basally moderately curved; hypopygium (Fig. 15) characteristic, with anterior margin straight and posterior margin smoothly curved. Relative measurements (paratype): ovipositor length 86, gonostylus 25 [mid tibia 83].

MALE. Unknown.

VARIATION. There is slight variation in the relative width of the frontovertex, setation at the base of the forewing and coloration of the thorax and mid and hind femora. The femora may be largely to almost completely yellow and there may be very little blue coloration on the mesoscutum and scutellum.

HOSTS. Unknown.

DISTRIBUTION. Brunei, Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, BRUNEI: Bukit Sulang, Nr. Lamunin, B.M. 1982–388, 20.viii–10.ix.1982 (N.E. Stork) (BMNH). Paratypes, BRUNEI: 3♀, same data as holotype (BMNH); INDONESIA: 4♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, BMNH Canopy Fog #11, 10.iii.1985; 2♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, iv.1985 (J.S. Noyes) (BMNH).

COMMENTS. Females of *Ooencyrtus acca* are generally similar to *O. guamensis* and the Neotropical species *O. syrphidis* Noyes. All three species have a robust body, antennae with clava obliquely truncate at apex and the sensory area extensive but less than one-third length of clava, forewing with postmarginal vein less than half as long as stigmal vein and hypopygium with a straight anterior margin (Fig. 15). *Ooencyrtus acca* and *syrphidis* can both be separated from *O. guamensis* by the absence of silvery setae on the mesoscutum, the posterior half of scutellum being smooth and the forewing with a realtively large conspicuous naked basal area. *Ooencyrtus acca* differs from *syrphidis* in having F1–F4 transverse and shallower sculpture on the scutellum basally. In *syrphidis* F1–4 are at least slightly longer than broad and the basal half of the scutellum has deep punctate-reticulate sculpture.

Ooencyrtus phongi Trjapitzin, Myartseva & Kostyukov

(Figs 16–21)

Ooencyrtus phongi Trjapitzin, Myartseva & Kostyukov, 1977: 671–672. Holotype ♀, Vietnam (ZISP, not examined).
Ooencyrtus sp.; Liao *et al.*, 1987: 176–177.
Ooencyrtus sp. I; Mehra, 1966.

DIAGNOSIS. All coxae, femora and gaster black; flagellum unicolorous testaceous; scutellum with about anterior one-third darker than posterior two-thirds; mandibles (Fig. 18) with one tooth and a broad truncation, the truncate part with numerous denticles; scutellum with deep, regular, raised reticulate sculpture covering nearly whole surface, only the hind vertical margin smooth and shiny; clypeus slightly protuberant ventrally. Female (length 1.03–1.71 mm): head (Fig. 17) with frontovertex a little more than one-quarter head width; posterior ocelli slightly but distinctly separate from eyes; antenna (Fig. 16) with F6 shorter than F1, proximal 3 funicle segments longer than broad, clava less than 3 times as long as broad, with outer suture oblique and apex obliquely truncate; forewing basally as in Fig. 19; ovipositor similar to Fig. 335 and hypopygium similar to Fig. 36. Male (length 0.9–1.3 mm): generally similar to female but antenna (Fig. 21) with all funicle segments clearly longer than broad and setae about twice as long as diameter of segments; forewing base similar to Fig. 19; genitalia (Fig. 20) with aedeagus about half as long as mid tibia.

HOSTS. Recorded as a parasitoid of the eggs of Lepidoptera (Trjapitzin *et al.*, 1977), but this record needs confirmation. The species is recorded reliably below from the eggs of *Tessaratoma papillosa*, *Tessaratoma javanica* (see also Mehra, 1966) and *Pycanum ponderosum* (Hemiptera: Tessaratomidae). It has been recorded as an important parasitoid of the eggs of *T. papillosa* in Thailand (Nanta, 1988), parasitizing more than 50% of the eggs of this pest of litchi and longan (*Dimocarpus longan*).

DISTRIBUTION. India, Thailand, Vietnam, P.R. China, Philippines, Malaysia, Indonesia.

MATERIAL EXAMINED. Type material. Paratypes, VIETNAM: 8♀, Quang-Nin', from the eggs of Lepidoptera, 4.vi.1975 (Cam Phong) (BMNH).

Other material: INDIA: 2♀, Bihar, Racnhi, Namkum, ex eggs of *Tessaratoma javanica*, 17.xi.1961 (B. P. Mehra); 4♀, Bihar, Ranchi, Namkum, ex. eggs of *Tessaratoma javanica*, 15.iii.1956 (B.P. Mehra); 1♀, Karnataka, 25km W. of Mudigere, 28.x–3.xi.1979 (J.S. Noyes); 1♂, Karnataka, Bannerghatta NP, 1979 (Z. Boucek & J.S. Noyes); THAILAND: 21♀, 11♂, Chiang Mai, ex. eggs of longan bug (=*Tessaratoma papillosa*), iii.1982 (F. Nanta). VIETNAM: 13♀, 1♂, Tonkin, Hanoi, from the eggs of *Tessaratoma papillosa*, vi.1937; P.R. CHINA: 3♀, Fujian, Kuiqi, ex. eggs of *Tessaratoma papillosa*, 18.viii.1957 (R. Zhang); 12♀, 3♂, Fujian, Fuzhou, ex. eggs of *Tessaratoma papillosa*, vi.1991 (Y. Tang); 7♀, 1♂, Hongkong, ex. eggs of *Tessaratoma papillosa*, 16.vi.1991 (C.Lau); 23♀, 3♂, Hainan, Haikou, ex eggs of *Tessaratoma papillosa*, 3.vi.1988 (F.D. Bennett & Ren Hui); 21♀, 4♂, Hainan, Haikou, 25.v.1983 (Z. Boucek); 3♀, 1♂, Hainan, Tiefong Mts., 18.v.1983 (Z. Boucek); 16♀, Hainan, Qongzhong, 620m, from litch, 26.vi.1964 (D.–x. Liao); 3♀, Hainan, Qongzhong, Yinggeng, ex. eggs of *Tessaratoma papillosa*, 28.vi.1964 (D.-x. Liao); 10♀, Hainan, Qongzhong, Yinggeng, ex eggs of *Tessaratoma papillosa*, 19.vi.1964 (D.-x. Liao); 19♀, 10♂, Hainan, Xinglong, ex eggs of *Tessaratoma papillosa*, 14.vi. 1963 (B. Zhang); 24♀, Hainan, Dangxiang, 7.v.1983 (Z. Boucek); PHILIPPINES: 1♀, Palawan, Inaguan River Valley, 700m, 29.i–2.ii.1988 (J.H. Martin); MALAYSIA: 20♀, Kuala Lumpur, ex eggs of *Pycanum ponderosum* Stal., 29.vii.1929 (H. Corbett); INDONESIA: 1♀, Krakatau, Sertung forest, 15.ix.1984 (S.G. Compton). Material in BMNH, IZAS.

COMMENTS. We have examined the material cited as *Ooencyrtus* sp. by Liao, et al. (1987) and are confident that it belongs to the present species.

Ooencyrtus acus sp.n.

(Figs 22–27)

Echthrodryinus sp., Jadhav & Varma, 1988: 133.

DIAGNOSIS. Mandibles more or less tridentate in appearance; scutellum with deep reticulate sculpture and only posterior vertical margin smooth; forewing without a conspicuous basal naked area. Female: antennae (Fig. 22) with F6 as long as or little longer than F1, the latter subquadrate; proximal 4 or 5 funicle segments somewhat longer than broad or subquadrate; clava enlarged and about 2.5 times as long as broad, with outer suture oblique and apex obliquely truncate with sensory area occupying nearly half length of

clava; frontovertex about one-quarter head width; posterior ocelli distinctly separated from eyes; gaster acute apically and ovipositor slightly but distinctly exserted. Male: generally similar to female but antennae (Fig. 26) with proximal funicle segments slightly longer than broad and distal segments quadrate or transverse, the setae not longer than diameter of segments; tegulae basally yellow.

FEMALE. Length 0.9–1.3 mm (holotype 1.2 mm).

Head blackish, a dark metallic green sheen on frontovertex, face metallic green, interantennal prominence dorsally purple; antenna with radicle, basal dorsal half of pedicel and flagellum testaceous, scape and distal half of pedicel yellow; pronotum, mesoscutum and axillae blackish with metallic green or blue tinge; tegulae dark brown; scutellum metallic blue or green, brighter than mesoscutum; mesopleuron and propodeum dark brown; coxae and middle part of femora dark brown or blackish, ends of femora, tibia and tarsi yellow, pretarsi brown, usually at the base of tibia with a brown ring; wings hyaline, venation brownish; gaster blackish with a slight metallic green and purple sheen; ovipositor sheath blackish.

Head in ocellar area dull, with fine, raised reticulations; face and genae shiny, reticulations on them longitudinally elongate; ocelli forming an equilateral triangle; posterior ocelli separated from occipital margin by about 1.5 times their own diameters and conspicuously separated from eye margins; frontovertex one fourth head width; eyes conspicuously hairy; occipital margin slightly rounded; antennae inserted far below the ventral eye margin; clypeus with lower margin straight; antennae (Fig. 22) with F1–4 subequal in length and subquadrate, and subequal to or little shorter than F5 and F6; F6 and sometimes F5 somewhat broader than long; clava clearly enlarged and about 2.5 times as long as broad, about as long as F3–6 together; clava with outer suture oblique and apex broadly obliquely truncate, with sensory area occupying the whole ventral surface of last segment; mandibles with one tooth and a broad, strongly concave truncation which gives the mandibles a more or less tridentate appearance (similar to Fig. 268). Relative measurements (holotype): head width 44, head height 42, minimum frontovertex width 11, POL 5, OPL 5, OOL 0.7, eye length 28, eye width 23, malar space 15, scape length 19, scape width 4; other proportions of the antennae as in Fig. 22.

Mesoscutum with shallow transversely imbricate sculpture which is clearly shallower than sculpture of scutellum; scutellum pointed posteriorly, with regular raised, reticulate sculpture and only posterior vertical margin smooth; mesopleuron with shallow longitudinally elongate sculpture; forewing with venation and distribution of setae basally as in Fig. 23. Relative measurements (holotype): forewing length 102, forewing width 43; hindwing length 65; hindwing width 15.

Gaster a little longer than thorax plus head; ovipositor as in Fig. 24, conspicuously exserted, the exserted part about as long as mid tibial spur; hypopygium as in Fig. 25. Relative measurements: ovipositor length 81, gonostylus 20 [mid tibia 45].

MALE. Length about 0.9 mm.

Similar to female but differs slightly in coloration, antennal structure, frontovertex width and genitalia. Antenna with scape ventrally yellow, flagellum testaceous-yellow; legs with mid-femora yellow, other femora and coxae brown; tegulae basally yellow, brown at apex; antenna as in Fig. 26, with proximal funicle segments only slightly longer than broad, distal segments quadrate or transverse and setae not longer than diameter of segments; frontovertex two-fifths to one-third head width; posterior ocellus separated from occipital margin by less than its length (3: 4); gaster conspicuously shorter than head and thorax together; genitalia as in Fig. 27 with aedeagus about as long as mid tibia.

VARIATION. Very little in material available apart from that discussed above under coloration and antennal structure.

HOSTS. Jadhav & Varma (1988) recorded this species (as *Echthrodryinus* sp.) as a gregarious hyperparasitoid of the prepupae or pupae of *Epiricania melanoleuca* (Lepidoptera: Epipyropidae), an important ectoparasitoid of *Pyrilla perpusilla* (Homoptera: Lophopidae) which is a common pest of sugarcane in India and elsewhere.

DISTRIBUTION. India.

MATERIAL EXAMINED. Type material. Holotype ♀, INDIA: Maharashtra, Dadh, ex cocoon of *Epricania melanoleuca*, 31.x.1991 (R.B. Jadhav) (BMNH). Paratypes, 11♀, 1♂, same data as holotype; INDIA: 5♀, Maharashtra, Chandegaon, ex cocoon of *Epipyrops melanoleuca*, CIE A15767, 25.x.1985 (R.B. Jadhav); 4♀, ?Maharashtra, Satral, ex cocoon of *Epipyrops melanoleuca*, CIE A15767, 2.i.1984 (R.B. Jadhav), *Echthrodryinus* sp. det. B.R. Subba Rao, 1984; 3♀, Maharashtra, Ravalgaon, ex pupa of *Epipy-*

rops sp., CIE A15395, 5.xi.1982, *Echthrodryinus* sp., det. B.R. Subba Rao, 1983; 6♀ (one on slide), 1♂, Maharashtra, Sade, ex. pupa of *Epipyrops melanoleuca*, CIE A14657, 13.ix1982 (MSG), *Echthrodryinus* sp. det. B.R. Subba Rao, 1983; 3♀, 1♂, Gujarat, Navsari, ex. pupa of *Epipyrops melanoleuca*, CIE A15356, 9.i.1983 (Z. Patel), *Echthrodryinus* sp. det. B.R. Subba Rao, 1983; 3♀, Uttar Pradesh, Lucknow, ex. cocoon of *Epipyrops*, CIE A11011, x.1976 (N. Nigam), ?*Echthrodryinus* sp., 1977; 3♀, Orissa, Sankumari, ex. pupa of *Epiricania melanoleuca*, CIE A19437, xi.1987. Material in BMNH.

COMMENTS. Females of *Ooencyrtus acus* share the following common characters with *O. phongi* and *O. lucens*: scutellum with fairly deep, regular raised reticulations, with only posterior vertical margin smooth; clava enlarged, with outer suture oblique and apex obliquely truncate and enlarged sensory area that is nearly half as long as clava. *Ooencyrtus acus* can be separated from *phongi* and *lucens* by the tridentate appearance of the mandibles, acute apex of the gaster, the ovipositor distinctly exserted, the forewing basally without conspicuous naked area (compare Figs 23, 19 and 35) and the second valvifers basally being relatively narrow and more strongly curved. In *phongi* and *lucens* the mandibles have a broad, straight truncation, the gaster is apically truncate, the ovipositor is not exserted, and the base of the forewing has a more or less conspicuous naked area.

Ooencyrtus caurus sp.n.

(Figs 28–33)

DIAGNOSIS. Mandibles with one very small tooth and a broad truncation; legs with coxae and femora black. Female: body black, dorsum of thorax bright metallic blue or green mixed with purple; gaster shorter than thorax; scutellum with posterior one-third smooth, anteriorly with punctate-reticulate sculpture; clava with outer suture oblique, its apex obliquely truncate with sensory part nearly half as long as clava; F1–F3 small, transverse, conspicuously smaller than distal funicle segments (Fig. 28); vertex one-fifth head width; basal cell of forewing posteriorly without hairs on ventral side, basal naked area large, nearly closed posteriorly (Fig. 29), postmarginal vein very short, about one-third as long as stigmal vein. Male: generally much duller than female, but with scutellum bright metallic green; antenna with longest setae on funicle about 3 times as long as diameter of any segment; F1 shortest, slightly longer than broad and as long as pedicel (Fig. 32), F2–6 each about 1.5 times as long as broad.

FEMALE. Length, including ovipositor: 0.65–0.95 mm (holotype 0.82 mm).

Head black, dull purplish mixed with green especially on face and genae, shining green between ocelli and occipital margin; antennae yellow, only pedicel proximally somewhat brownish; pronotum blackish; mesoscutum with strong dark blue or purple sheen; axillae blackish; scutellum with anterior three-fifths green, posterior two-fifths metallic blue; mesopleuron and propodeum dark brown or black; legs with coxae and femora excluding tip black, concolorous with mesopleuron; wings hyaline, venation testaceous-yellow; gaster black dorsally with strong basal metallic blue or green sheen.

Head with shallow, regular hexagonally reticulate sculpture on frontovertex, lower parts of face laterally and genae with elongate reticulations; ocelli forming an angle of about 45°; posterior ocelli separated from occipital margin by about 1.5 times their own length and almost touching eye margins; eye without conspicuous setae; occipital margin sharp, but not carinate; antennae inserted far bellow the ventral eye margin; antennae (Fig. 28) with pedicel plus flagellum conspicuously shorter than head width; F1–3 conspicuously smaller than F4–6 which are subquadrate; clava as long as F3–6 together and with outer suture strongly oblique and its apex obliquely truncate with sensory area nearly half as long as clava; mandibles with one very small outer tooth and a broad truncation armed with minute denticles. Relative measurements (holotype): head width 46, head height 40, minimum frontovertex width 9, POL 5, OOL 0.5, eye length 27, eye width 25, malar space 15, scape length 17, scape width 4; other proportions of antennae as in Fig. 28.

Mesoscutum about 1.2 times as long as scutellum and about 1.7 times as broad as long, with shallow transverse imbricate sculpture; scutellum anteriorly with deep, regular reticulate sculpture its posterior one-third smooth; forewing with venation and basal setation as in Fig. 29. Relative measurements (holotype): forewing length 93, forewing width 38; hindwing length 62, hindwing width 14.

Gaster in specimens at hand extremely compact, less than half thorax length (although in critical point dried material the gaster may be much more distended); ovipositor hidden; ovipositor (Fig. 30) with second valvifers basally moderately curved and gonostyli short; hypopygium as in Fig. 31. Relative measurements

(paratype): ovipositor length 40, gonostylus 7 [mid tibia 42].

MALE. Length about 0.65 mm.

Differs from female in coloration and structure of the antennae, relative width of frontovertex, duller coloration, and structure of genitalia. Antennae (Fig. 32) with radicle, scape and pedicel brown, flagellum testaceous; mesoscutum dull with a slight brassy and purplish sheen; frontovertex two-fifths head width; ocelli forming a equilateral triangle; posterior ocelli separated from occipital margin by their own lengths and conspicuously separated from eyes; genitalia as in Fig. 33, with aedeagus about 0.75 times as long as mid tibia.

VARIATION. In the female the frontovertex varies from about one-fifth to one-sixth head width; the flagellum may be unicolorous yellow or with clava conspicuously darker and brownish.

HOSTS. Recorded below from the eggs of *Amblypelta* sp. (Homoptera; Coreidae) on *Abelmoschus manihot* and from the eggs of *Amblypelta lutescens*, a pest of banana in Queensland, Australia (H.A.C. Fay, pers. comm.).

DISTRIBUTION. Papua New Guinea, Australia.

MATERIAL EXAMINED. Type material. Holotype ♀, PAPUA NEW GUINEA: Central Province, Laloki, ex *Amblypelta* eggs on *Abelmoschus manihot*, 24.vi.1983 (F. Dori). Paratypes, 10♀, 2♂ (1 on slide), same data as holotype; 5♀, Laloki Rs. Stn, ex eggs of *Amblypelta lutescens papuensis*, CIE A20325, 24.viii.1989 (F. Dori); AUSTRALIA: 4♀, 3♂, Queensland, Mareeba, ex eggs of *Amblypelta lutescens lutescens* (Distant) on banana, 6.x.1992 (H.A.C. Fay). Material in BMNH.

COMMENTS. *Ooencyrtus caurus* is very close to *lucens*, females of both species having an obliquely truncate clava, relatively short antennal segments, similar mandibular stucture, generally similar habitus and body coloration. *O. caurus* can be separated from *lucens* in having the posterior one-third of the scutellum completely smooth and polished whereas in *lucens* the scutellum is almost entirely reticulate. See also comments under *lucens* (below).

Ooencyrtus lucens sp.n.

(Figs 34–36)

DIAGNOSIS. Female: all coxae and femora dark, concolorous with mesopleuron; scutellum wholly bright green-blue, with moderately deep-punctate sculpture over most of its surface and only its extreme posterior margin smooth; antennae (Fig. 34) with flagellum usually with funicle testaceous-yellow and clava brownish; F6 longer than F1, F1–3 transverse; clava with outer suture oblique and apex obliquely truncate and with sensory area about half as long as clava; frontovertex about one-fifth head width.

FEMALE. Length 0.70–1.15 mm (holotype 0.95 mm).

Very similar to *caurus* but differing in the deeper, more extensive reticulate sculpture of the scutellum (see diagnosis). Antennae as in Fig. 34; forewing base as in Fig. 35; hypopygium as in Fig. 36; ovipositor similar to Fig. 335. Relative measurements (holotype): head width 46, head height 44, minimum frontovertex width 7.5, POL 3.5, OPL 5, OOL 0.3, eye length 31, eye width 24, malar space 18, scape length 19, scape width 4.5; forewing length 96, forewing width 40; hindwing length 65, hindwing width 16; (paratype): mid tibia 90, ovipositor length 87, mid tibia 90, gonostylus 15.

MALE. Unknown.

HOSTS. Recorded below from the eggs of *Achaea janata* (Lepidoptera: Noctuidae) and from an unidentified pentatomid (Hemiptera: Pentatomidae).

DISTRIBUTION. India, Brunei, Malaysia, Philippines.

MATERIAL EXAMINED. Type material. Holotype ♀, BRUNEI: Bukit Sulang, Nr. Lamunin, B.M. 1982–338, 20.viii–10.ix.1982 (N.E. Stork) (BMNH). Paratypes, INDIA: 1♀, Karnataka, 25km W. of Mudigere, 28.x–3.xi.1979 (J.S. Noyes); INDIA: 3♀, Andaman Islands, Port Blair, ex *Achaea janata*, 3.vii.1992 (K. Veenakumari); MALAYSIA: 1♀, Sabah, Longkong, ex Pentatomid, CIE A13458, 16.ix.1981 (G.J. Lim); BRUNEI: 7♀, same data as holotype; 1♀, PHILIPPINES: Leyte, Baybay, ix.1980 (R. Vane-Wright).

COMMENTS. *Ooencyrtus lucens* is most similar to *phongi* and *caurus*, all three species having mandibles with one small tooth and a broad straight truncation; coxae and most part of femora dark, concolorous with mesopleuron; scutellum deeply reticulate at least in anterior half or so; clava with outer suture oblique and its apex obliquely truncate with sensory part very extensive, about half as long as clava. Females of both *lucens* and *caurus* can be separated from *phongi* by the lack of silvery setae on the meoscutum, F6 being

longer than F1 (in *phongi* F6 is shorter than F1); flagellum at least partially yellowish (unicolorous dark brown in *phongi*) and the scutellum wholly brightly metallic (in *phongi* the anterior part of the scutellum is relatively dull). See also comments under *caurus*.

Ooencyrtus minerva sp.n.

(Figs 37, 38)

DIAGNOSIS. Female: body, excluding legs, generally blackish with a weak metallic green or bluish sheen on the frontovertex and dorsum of thorax and gaster; funicle segments dark testaceous, clava yellow; all coxae and femora, except apices, black; antennae (Fig. 37) with flagellum filiform and all funicle segments longer than broad, clava not broader than funicle segments and with sensory area at apex only; mandibles with one small tooth and a very broad straight truncation; scutellum in anterior three-fifths with regular, raised punctate-reticulate sculpture, posterior two-fifths smooth and shiny; forewing (Fig. 38) without distinct basal naked area, linea calva closed posteriorly.

FEMALE. Length 1.35 mm.

Head on frontovertex with a weak metallic green sheen, face with a stronger metallic blue-green reflection; interantennal prominence coppery purple, lower face and genae with a slight purple lustre and less shiny; antennae with radicle black, dorsal sides of scape black and rest of scape testaceous; pedicel and funicle segments dark testaceous, clava yellow; pronotum, mesoscutum and axillae blackish with a weak metallic blue tinge; scutellum with anterior three-fifths dark green and relatively dull, posterior two-fifths blue, shiny, much brighter than anterior part; mesopleuron and propodeum blackish; coxae, femora except apices blackish, trochanters, apex of femora, tibia and tarsi testaceous to yellow; wings hyaline, venation testaceous; gaster blackish with a metallic green and purple tinge; ovipositor sheaths blackish.

Head in ocellar area with fine, raised reticulations; reticulations on genae longitudinally elongate; ocelli forming a 45° angle, posterior ocelli separated from occipital margin by about 1.5 times their own lengths and almost touching eye margins; frontovertex about one-sixth head width; eyes naked, without conspicuous setae; occipital margin slightly rounded; antennae inserted just below the ventral eye margins, toruli separated from mouth margin by little more than their own lengths; antennae (Fig. 37) with all funicle segments conspicuously longer than broad, clava a little shorter than F4–6 together, with sensory part limited at apex only; mandibles with one small tooth and a very broad straight truncation. Relative measurements: head width 53, head height 50, minimum frontovertex width 9, POL 4.5, OPL 4.5, OOL 0.5, eye length 37, eye width 30, malar space 20, scape length 25, scape width 5; other proportions of the antenna as in Fig. 37.

Mesoscutum with shallow, transverse imbricate-reticulate sculpture; scutellum in basal three-fifths with deep, regular, punctate-reticulate sculpture, posterior two-fifths smooth; fore wing with venation and distribution of setae basally as in Fig. 38. Relative measurements: forewing length 123, forewing width 50; hindwing length 82, hindwing width 20.

Gaster shorter than thorax; ovipositor not exserted, the gonostyli very short, only very slightly longer than half length of mid tibial spur.

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Malaysia.

MATERIAL EXAMINED. Type material. Holotype ♀, MALAYSIA: Genting Tea Est., vii–viii.1985, 2000m (W. Budenberg) [right wings and antenna mounted on slide] (BMNH).

COMMENTS. *Ooencyrtus minerva* and *ceres* are similar in that both species have a bicolorous flagellum with the funicle dark testaceous and clava yellow, all funicle segments longer than broad, scutellum with punctate sculpture anteriorly and smooth posteriorly and the forewing with the linea calva closed posteriorly. The two species can be separated on the relative width of the frontovertex (*minerva* one-sixth and *ceres* one quarter head width), relative length of the pedicel and flagellum together (*minerva* 1.4 times and *ceres* 1.2 times head width), relative proportions of the antennal segments (*minerva* F6 shorter than F1 and *ceres* F1 shorter than F6) and coloration of scutellum (*minerva* anteriorly dark green and dull but in *ceres* the scutellum is entirely green-blue).

Ooencyrtus icarus sp.n.

(Figs 39–40)

DIAGNOSIS. Female: antennae with radicle and proximal two-thirds of scape brownish, flagellum testaceous, all coxae and femora including mid-femora dark brown of black; mandibles with one very small tooth and a broad truncation; flagellum filiform with all funicle segments longer than

broad, clava not broader than funicle segments, its apex pointed and with a small sensory area at apex only; scutellum with regular fine punctate-reticulate sculpture, in posterior fifth or so shallower and with posterior margin smooth, apex moderately pointed; forewing (Fig. 40) without conspicuous naked area basally; linea calva closed posteriorly.

FEMALE. Length about 0.95 mm.

Head blackish with a metallic green sheen, interantennal prominence purple; antennae with radicle and proximal two-thirds of scape blackish, distal one-third of scape testaceous, pedicel proximally brownish and distally testaceous, flagellum testaceous; pronotum, mesoscutum, axillae and anterior one-third of scutellum blackish with weak metallic green, coppery or brassy tinge; posterior two-thirds of scutellum metallic blue, much brighter than anterior part which is relatively dull and purplish; mesopleuron and propodeum blackish; coxae and femora except the extreme ends concolorous with mesopleuron, both ends of femora yellow; wings hyaline, venation testaceous; gaster blackish with a metallic green and purple tinge; ovipositor sheath black.

Head in ocellar area with fine, raised reticulate sculpture; reticulations on genae longitudinally elongate; ocelli forming an acute triangle (about 40°), the posterior ocelli separated from occipital margin by about their own lengths and almost touching eye margins; frontovertex a little more than one-fifth head width; eyes clothed in short, inconspicuous translucent setae; occipital margin acute; antennae inserted just below the ventral eye margin; toruli separated from mouth margin by a little less than their own lengths; antennae (similar to Fig. 32) with pedicel plus flagellum as long as head width; all funicle segments conspicuously longer than broad, subequal in length; clava about as long as preceding three segments together, with sensory area very small and inconspicuous; mandibles (Fig. 41) with one obtuse small tooth and a broad truncation bearing minute denticulae. Relative measurements (holotype): head width 46, head height 41, minimum frontovertex width 10, POL 5, OPL 2.5, OOL 0.2, eye length 28, eye width 25, scape length 17, scape width 4; other proportions of the antenna similar to Fig. 32.

Thorax with shallow, transverse imbricate-reticulate sculpture on mesoscutum; scutellum with deeper, regular, finely reticulate sculpture becoming shallower in apical one-fifth or so with apex moderately pointed and nearly smooth; fore wing with venation and distribution of setae basally as in Fig. 40, without a conspicuous naked area, linea calva closed posteriorly, postmarginal vein half as long as stigmal vein. Relative measurements (paratype): forewing length 99, forewing width 41; hindwing length 70; hindwing width 16.

Gaster with ovipositor hidden; ovipositor similar to Fig. 335, with gonostyli about one-fifth as long as ovipositor; hypopygium as in Fig. 39. Relative measurements: ovipositor length 107, gonostylus 20 [mid tibia 95].

MALE. Unknown.

HOSTS. Recorded below from the eggs of *Dasynus kalshoveni* (Hemiptera: Coreidae).

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Java, Semarang, ex eggs of *Dasynus kalshoveni*, iv.1937 (J.S. Phillips). Paratype, 1♀ (on slide) same data as holotype. All material in BMNH.

COMMENTS. Females of *Ooencyrtus icarus* are similar to those of *iris*, both species having the mandible with a broad, minutely denticulate truncation, relatively long funicle segments, unicolorous flagellum and forewing with a closed linea clava. However, in *O. icarus* the mid femora are blackish (yellow in *iris*) and the scutellum has finely reticulate (almost punctate) sculpture over most of its surface (anterior half shallow and irregular and posterior half smooth and shiny in *iris*). Superficially both species also resemble *caurus* and *lucens* but the antennae are more filiform and the clava lacks the obliquely truncate apex with an extensive sensory area.

Ooencyrtus adonis sp.n.

(Figs 42–44)

DIAGNOSIS. Female: flagellum unicolorous; legs with coxae and femora dark brown, concolorous with mesopleuron, tibiae each proximally dark brown or with a dark ring; gaster totally brown; mandibles with four teeth (similar to Fig. 46); scutellum with extremely shallow sculpture in anterior half and with posterior half smooth; antennae (Fig. 42) with F1–4 relatively small, transverse or quadrate and much smaller than either F5 or F6 which are subequal in size; clava not conspicuously broader than funicle segments, apically more or less rounded and with only a small sensory area at apex; frontovertex about two-fifths head width; posterior ocelli distinctly separated from eyes; ovipositor far exserted, exserted part from half to one-third gaster length.

FEMALE. Length, excluding ovipositor, 0.5–0.68 mm (holotype 0.68 mm).

Frontovertex and genae dark brown with weak metallic green and purple tinge, lower face including interantennal prominence slightly paler brown; antennae with radicle, dorsal sides of scape and pedicel brownish; ventral sides of scape and pedicel and flagellum testaceous-yellow; pronotum, mesoscutum, axillae and anterior half of scutellum dark brown with a weak metallic green or purple sheen; scutellum posteriorly shiny blue-green shiny; mesopleuron brown; propodeum dark brown; legs with coxae and femora brown, tibiae proximally dark brown or with a dark ring; wings hyaline, venation testaceous; gaster brown; ovipositor sheaths brown.

Head in ocellar area with fine, raised reticulations; sculpture on frons, lower face and genae longitudinally elongate; ocelli forming a slightly obtuse angle, posterior ocelli separated from occipital margin by at most their own lengths and distinctly separated from eye margins; frontovertex about two-fifths head width (Fig. 43); eyes without conspicuous setae; occipital margin more or less rounded; antennae inserted slightly below ventral eye margin (Fig. 43), toruli separated from lower margin of face by their own length or less; antennae (Fig. 42) with F1–4 relatively small, transverse or quadrate and much smaller than either F5 or F6 which are subequal in size; clava as long as F3–6 together, not conspicuously broader than funicle segments, apically more or less rounded and with only a small sensory area at apex; mandibles (similar to Fig. 46) with four teeth. Relative measurements (holotype): head width 24, head height 21, minimum frontovertex width 10, POL 5, OPL 1.5, OOL 1, eye length 14, eye width 10.5, malar space 9, scape length 10, scape width 2; other proportions of the antennae as in Fig. 42.

Mesoscutum with transverse imbricate-reticulate sculpture which is deeper than sculpture of scutellum; scutellum with very shallow longitudinally elongate polygonal sculpture in anterior half, the posterior part smooth; forewing with venation and distribution of setae basally as in Fig. 44. Relative measurements (holotype): forewing length 56, forewing width 25; hindwing length 41, hindwing width 9.

Gaster, including ovipositor, about as long as thorax or shorter; ovipositor (similar to Fig. 49) far exserted, the exserted part about one-third to half gaster length, or about half length of mid-tibia; hypopygium similar to Fig. 50. Relative measurements (paratype): ovipositor length 41, gonostylus 11.5 [mid tibia 19].

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Nepal.

MATERIAL EXAMINED. Type material. Holotype ♀, NEPAL: Bardia, 10–24.iii.1983 (M.G. Allen). Paratypes, 3♀, same data as holotype. All material in BMNH.

COMMENTS. *Ooencyrtus adonis* is probably closest to *aeneas*, both species having brown coxae and femora, relatively wide frontovertex, shallow sculpture on scutellum, ovipositor well exserted and mandibles with four teeth. *O. adonis* can be separated from *aeneas* by the structure of the antennae and relative length of the exserted part of the ovipositor. In *aeneas* the funicle segments are all subquadrate and subequal in size, except for F1 which is conspicuously transverse and the exserted part of the ovipositor is about one-quarter as long as the gaster.

Ooencyrtus aeneas sp.n.

(Figs 45–50)

DIAGNOSIS. Coxae and femora dark brown, tibiae mostly dark brown; mandibles with four teeth (Fig. 46); antennae (Fig. 47) with F1 small and transverse, much smaller than F2–6 which are slightly longer than broad and subequal; clava apically rounded with sensory area on apex only; head with frontovertex about one-third head width; posterior ocelli distinctly separated from eyes; scutellum anteriorly with shallow sculpture and posteriorly smooth and shiny; ovipositor exserted, exserted part about one-quarter as long as gaster.

FEMALE. Length, excluding ovipositor, 0.83 mm.

Head dark brown with a slight brassy sheen on frontovertex and greenish in scrobal area; antennae with radicle, dorsal sides of scape and pedicel brown; ventral sides of scape and pedicel and flagellum testaceous; pronotum, mesoscutum and axillae dark brown or blackish with a slight purple lustre; scutellum with anterior three-fifths blackish with a purple sheen, posterior two-fifths metallic green or blue; mesopleuron brown; propodeum blackish; legs with coxae and femora brown, tibiae with basal three-fifths dark brown; wings hyaline, venation testaceous; gaster brown; ovipositor sheath brown.

Head in ocellar area with fine, raised reticulate sculpture; sculpture on lower face and genae longitudinally elongate; ocelli forming a right angle, posterior ocelli about equidistant from

occipital and eye margins; frontovertex one-third head width; eyes without conspicuous setae; occipital margin more or less rounded; antennae inserted slightly below ventral eye margin (Fig. 45); toruli separated from mouth margin their own lengths; antennae (Fig. 47) with F1 transverse and clearly much smaller than any of the following segments which are wider and at least slightly longer than broad; clava with a small sensory area at apex only; mandibles (Fig. 46) with four teeth. Relative measurements (holotype): head width 29, head height 25, minimum frontovertex width 10, POL 4.5, OPL 1.5, OOL 1, eye length 17, eye width 13, malar space 11, scape length 11, scape width 2.5; other proportions of the antennae as in Fig. 47.

Mesoscutum with transverse imbricate sculpture which is clearly deeper than that on scutellum; sculpture on anterior three-fifths of scutellum shallow and more or less longitudinally elongate or polygonal espcially medially, posterior two-fifths smooth and shiny; fore wing with venation and distribution of setae basally as in Fig. 48. Relative measurements (holotype): forewing length 71, forewing width 28; hindwing length 45; hindwing width 10.

Gaster, excluding ovipositor, about as long as thorax; ovipositor (Fig. 49) exserted, the exserted part about one-quarter as long as gaster; hypopygium as in Fig. 50. Relative measurements: ovipositor length 107, gonostylus 30 [mid tibia 55].

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy Fog #13, 11.vii.1985. Paratype, 1♀, BMNH Canopy Fog #11, 10.iii.1985. Material in BMNH.

COMMENTS. *Ooencyrtus aeneas* is close to *adonis* (see comments under *adonis* above).

Ooencyrtus phoebi nom. nov.

Ooencyrtus major Ferrière, 1931: 285. LECTOTYPE ♀ (here designated), Indonesia (BMNH, examined).

DIAGNOSIS. Females (length 1.4–1.5 mm): body including gaster black, weakly metallic green or purple, scutellum in apical half or so more strongly metallic blue-green; legs with coxae and fore femora dark brown, mid femora mostly yellow, hind femora and tibiae mostly dark brown, fore and mid tibiae mostly yellow; mandibles with one minute tooth and a very broad truncation; scape slender; flagellum filiform; all funicle segments distinctly longer than broad; clava hardly wider than funicle, with sutures parallel and with sensory area at extreme apex only; eyes with conspicuous short setae; frontovertex at most one-quarter head width; scutellum with reticulate sculpture similar to that on mesoscutum, becoming shallow and shiny towards apex which is slightly pointed; forewing with a large basal naked area closed posteriorly; ovipositor slightly exserted, yellow. Males: none examined, but according to the original description all funicle segments are longer than broad and clothed with short setae.

HOSTS. Reared from the eggs of *Attacus atlas* (Lepidoptera: Saturniidae). According to Ferrière (1931) other egg parasitoids were also bred from the eggs of the same host, including *Anastatus menzeli* Ferrière, (Eupelmidae), *Agiommatus attaci* Ferrière (Pteromalidae) and *Tetrastichus* sp. (Eulophidae).

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Lectotype ♀, INDONESIA: Java, Buitenzorg, ex eggs of *Attacus atlas* F., vii.1925 (R. Menzel), B.M.TYPE HYM. 5. 1,073, originally with a red 'type' label and Ferriere's handwriting '♀ type'. Paralectotypes: 3♀, same data as the lectotype but each with a yellow 'Co-type' label (BMNH).

COMMENTS. This species seems to be closest to *Ooencyrtus kuvanae* (Howard) both species being relatively large, only weakly metallic, the legs extensively dark brown, the flagellum filiform with all funicle segments longer than broad, the sensory area of the clava limited to the extreme apex, the frontovertex at most one-quarter head width, and the forewing with a large basal naked area, closed posteriorly. *O. phoebi* can be separated from *kuvanae* by the conspicuously hairy eyes, paler leg coloration and shallower sculpture of the scutellum (see key).

The species name *major* is preoccupied in *Ooencyrtus* by *Ooencyrtus major* (Perkins, 1906).

Ooencyrtus kuvanae (Howard)

(Figs 51–53)

Schedius kuvanae Howard, 1910: 3–5. Holotype , Japan (USNM) [not examined].

Ooencyrtus kuwanae! (Howard); Mercet, 1926: 48–50.

Ooencyrtus kuwanai (Howard); Peck, 1951: 496. Invalid emendation of *kuvanae*.

OTHER CITATIONS. For a comprehensive reference list see Peck, 1963: 428–431; Brown, 1984 and Trjapitzin, 1989: 207–208.

DIAGNOSIS. Female (length 0.87–1.35 mm): body including gaster black or brown with a weak metallic green, blue or purple reflections on head and pronotum, mesoscutum with a relatively strong bluish sheen; scutellum medially in anterior half coppery purple, remainder metallic green, blue or purple; legs with coxae and at least proximal part of femora concolorous with mesopleuron, dark brown; ovipositor sheaths yellow; eyes without conspicuous setae; antennae (Fig. 51) with flagellum filiform, unicolorous; all of funicle segments distinctly longer than broad; clava with sensory area at extreme apex only; frontovertex about one-quarter head width; mandibles with a small outer teeth and a broad inner truncation; forewing (Fig. 53) with a small basal naked area which is closed posteriorly; scutellum almost entirely with fine reticulate sculpture which is conspicuously deeper than that on mesoscutum, only its vertical sides and apex smooth and polished; ovipositor very slightly exserted; hypopygium as in Fig. 52. Male (length 0.71–0.95 mm): generally similar to female but scutellum relatively dull; antennae with flagellum testaceous-yellow, all funicle segments about 2 times as long as broad and with longest setae about as long as diameter of segments; frontovertex about one-third head width.

HOSTS. *Ooencyrtus kuvanae* (Howard) is known primarily as an egg parasite of the gypsy moth, *Lymantria dispar* L. and may play an important role as a biological control agent of this well-known pest species (Brown, 1984). It has also been recorded from the eggs of lasiocampids including *Lymantria fumida* (Trjapitzin, 1989), *Dendrolimus spectabilis* and *Malacosoma neustria* (below), saturniids including *Eriogyna pyretorum* (Koidzumi & Shobata, 1940) and other lymantriids including *Stilpnotia salicis* (below) and *Nygmia phaeorrhoea* Donovan. In the laboratory, it has been reared successfully on the eggs of *Euproctis chrysorrhoea*, *Hemerocampa leucostigma*, *Hemerocampa definata* (Lymantriidae), *Hemileuca maia*, *H. oliviae*, *Callosamia promethea* (Saturniidae) and *Malacosoma americana* (Lasiocampidae) (see Brown, 1984). It has also been recorded as a hyperparasitoid of *Apanteles melanoscelus* (Braconidae) and *Anastatus disparis* (Euplemidae) parasitizing larvae and eggs respectively of *Lymantria dispar* (Muesebeck & Dohanian, 1927; Howard & Fiske, 1911). Records of *kuvanae* as parasitoids of coreid eggs in Nigeria by Matteson (1981) are erroneous, being misidentifications of *Ooencyrtus afer* (see Prinsloo, 1987).

DISTRIBUTION. Japan, P.R. China, Korea, Taiwan and also introduced into North America, Europe and north Africa.

MATERIAL EXAMINED. Extralimital material. USA: 9♀, 11♂, USDA-EPL, from eggs of *L. dispar*, i.1977; 1♀, 1♂, Gip(sy) Moth Lab(oratory), No 4139B; CROATIA: 10♀, 8♂, Vinkovici, ex eggs *Lymantria dispar*, viii.1972–x.1974 (J. Spaic); ALGERIA: 7♀, Ain Mokra nr Bône, ex ova of *Liparis dispar*, em viii and x.1931, *Ooencyrtus kuwanae* How. Ch.Ferrière det.; 3♀, Ain Mokra, ex *Lymantria dispar*, 1931 (J. de Lépiney); 3♀, 2♂, Chene-Liege Forest, ex eggs *Lymantria dispar*, ix.1984 (S. Hamza-Kroua); MOROCCO: 2♀, 2♂, Mamora Forest, ex *Lymantria dispar*, 1931 (J. de Lépiney); JAPAN: 1♀, Kyushu, Fukuoka, Hakozaki, ex egg *Malacosoma neustria tartacea* Motsch., 26.ii.1959 emerged 28.v.1959 (Y. Miyatake). P.R. CHINA: 13♀, 3♂, Beijing, ex eggs of lymantriid on poplar, x.1979; 5♀, Heilongjiang, Heishan, ex eggs of *Lymantria dispar* L., 30.vii.1976; Liaoning, Shenyang, ex eggs of *Lymantria dispar* L., 17.ii.1978 (Xiu Gongtian); 2♀, Shanxi, Yuncheng, ex eggs of *Stilpnotia salicis* (L.), 10.ix.1975; 4♀, Hebei, Funing, ex eggs of *Dendrolimus spectabilis* Butler, viii.1987 (D.-x. Liao). Material in BMNH, IZAS.

COMMENTS. We have not seen any Oriental material of this species, but it is possibly the species recorded by Li *et al.* (1981) from the eggs of *Lymantria xylina* Swinhoe in Fujian Province (P.R. China) and it has been recorded from Taiwan (Trjapitzin, 1989).

The species is most similar to *O. phoebi* (see comments under *phoebi*).

Ooencyrtus dis sp.n.

(Figs 54–58)

DIAGNOSIS. Female: face and scutellum bright metallic green; ocellar area and remainder of body blackish with a relatively weak metallic lustre; coxae blackish, femora, at least proximal two-thirds, especially dorsally, dark brown; remainder of legs yellowish; mandibles with three acute teeth (similar to Fig. 268); antennae (Fig. 54) with F1–3 somewhat transverse and F4–6 longer than broad, clava about as long as F3–6 together, not conspicuously broader than

funicle segments, with sutures parallel and with sensory area at extreme apex only; frontovertex one-fifth head width; scutellum with uniformly fine, punctate reticulate sculpture, only its extreme vertical apex smooth and shiny; ovipositor slightly exserted, exserted part about one-fifth as long as gaster.

FEMALE. Length, excluding ovipositor, about 1.1 mm (holotype 1.13 mm).

Head with ocellar area blackish but with weak metallic purple lustre, anterior to this distinctly metallic green, face bright metallic green, interantennal prominence purple, genae brassy-purplish; antennae with radicle, pedicel brown, scape testaceous-yellow, flagellum testaceous; pronotum, mesoscutum and axillae blackish with a moderate metallic green sheen; scutellum completely bright metallic green; mesopleuron black; propodeum blackish; legs with coxae and proximal two-thirds of femora, especially dorsally, dark brown; rest of legs yellow; wings hyaline, venation testaceous yellow; gaster black with metallic blue-green sheen on basal tergite; ovipositor sheaths brown.

Head in ocellar area with fine, raised reticulate sculpture, genae with longitudinally elongate sculpture; ocelli forming an angle of about 45°; the posterior ocelli separated from occipital margin by their own lengths and nearly touching eye margins; inner eye orbits strongly divergent ventrally (Fig. 56); frontovertex one-fifth head width; eyes with conspicuous short setae; occipital margin hardly rounded; head in facial view nearly as broad as high; antennae inserted just below ventral eye margins (Fig. 56), toruli separated from mouth margin by less than their own lengths; antennae (Fig. 54) with pedicel plus flagellum together about one-fifth longer than head width; pedicel nearly as long as F1–3 together which are somewhat transverse, F4–6 longer than broad; clava about as long as F3–F6 together, not conspicuously broader than funicle segments, its sutures parallel and with sensory area limited to extreme apex only; mandibles with three sharp teeth (similar to Fig. 268). Relative measurements (holotype): head width 42, head height 40, minimum frontovertex width 8, POL 3, OPL 3.5, OOL 0.1, eye length 29, eye width 25, malar space 13, scape length 20, scape width 4.5; other proportions of the antennae as in Fig. 54.

Mesoscutum with shallow imbricate sculpture; scutellum with more or less uniform, fine, punctate reticulate sculpture, only its vertical apex smooth and shiny; fore wing with venation and distribution of setae basally as in Fig. 55. Relative measurements (holotype): forewing length 93, forewing width 42; hindwing length 67; hindwing width 17.

Gaster, excluding ovipositor, distinctly shorter than thorax; ovipositor (Fig. 58) exserted, exserted part about one-fifth as long as gaster, gonostylus about one-fifth ovipositor length; hypopygium as in Fig. 57. Relative measurements: ovipositor length 48, gonostylus 11 [mid tibia 34].

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, ii.1985, FIT (J.S. Noyes). Paratype, 1♀, same data as holotype (BMNH).

COMMENTS. Females of *Ooencyrtus dis* can be separated from other species of the genus by the combination of the tridentate mandibles, strongly divergent inner orbits, totally green scutellum which is uniformly finely punctate reticulate and the dark brown coxae and femora.

***Ooencyrtus hercle* sp.n.** (Figs 58–63)

DIAGNOSIS. Body including gaster dark brown or black with a weak metallic blue sheen on mesoscutum, apex of scutellum more strongly shining blue or purple; legs with all coxae, femora except base and apex brown; tibiae mostly testaceous; mandible with one tooth and a broad truncation; scutellum with deeper sculpture than meoscutum; forewing (Fig. 60) with relatively dense setae in basal cell and dense fine setae on ventral side near hind margin; postmarginal vein as long as stigmal vein. Female: antennae (Fig. 59) with F1–3 subequal and subquadrate, conspicuously smaller than following ones, F6 somewhat transverse; clava as long as F3–6 together, sensory area limited to apex only; frontovertex one-third head width; ovipositor hidden or very slightly exserted. Male: antennae with all funicle segments slightly longer than broad and with setae a little longer than diameter of segments; frontovertex about two-thirds head width and aedeagus about two-thirds as long as mid tibia.

FEMALE. Length 0.5–0.6 mm, (holotype 0.57 mm).

Head dark brown or blackish with a weak metallic blue tinge; antennae with radicle, scape and pedicel blackish, flagellum brown testaceous; thorax dark brown or blackish with a

metallic blue sheen, scutellum anteriorly coppery, posterior quarter or so blue or purple; mesopleuron dark brown; legs with coxae and femora dark brown, base and apex of femora testaceous, tibia with basal two-thirds dark brown, distal one-third testaceous; wings hyaline, venation testaceous; gaster dark brown blackish with a slight metallic blue sheen; ovipositor sheaths brown.

Frontovertex with fine, raised reticulate sculpture; sculpture on genae longitudinally elongate; ocelli more or less forming a right triangle; posterior ocelli separated from occipital margin by their own lengths and distinctly separated from eye margins; frontovertex about one-third head width as in Fig. 62 (holotype a little more than one-third); eyes not conspicuously hairy; occipital margin rounded; toruli separated from mouth margin by slightly less than their own lengths; antennae (Fig. 59) with pedicel plus flagellum about as long as head width; pedicel slightly longer than F1–2 together; funicle segments slightly enlarged towards apex; F1–3 subequal and subquadrate, conspicuously smaller than F4–6; clava as long as F3–6 together, its sutures parallel and apex rounded with sensory area limited to extreme apex only; mandible with one tooth and a broad truncation. Relative measurements (holotype): head width 25, head height 23, minimum frontovertex width 9, POL 3, OPL 1.5, OOL 0.7, eye length 15, eye width 12, malar space 8.5, scape length 11.5, scape width 2, other proportions of the antennae as in Fig. 59.

Mesoscutum with shallow imbricate sculpture; scutellum with conspicuously deeper reticulate, polygonal sculpture which is more elongate laterally, the extreme posterior margin smooth and shiny; fore wing venation and distribution of setae basally as in Fig. 60; basal cell with dense setae on its ventral side near posterior wing margin; postmarginal vein as long as stigmal vein. Relative measurements (holotype): forewing length 65, forewing width 29; hindwing length 37; hindwing width 10.

Gaster shorter than thorax; ovipositor (similar to Fig. 86) with second valvifers basally moderately curved with curved part relatively long; gonostylus about one-fifth ovipositor length; hypopygium as in Fig. 61. Relative measurements: ovipositor length 83, gonostylus 18 [mid tibia 60].

MALE. (Length 0.54 mm). Generally similar to female but for antennae, relatively wider frontovertex and genitalia. Antennae (Fig. 63) with all funicle segments longer than broad, pedicel and flagellum together distinctly longer than head width; longest setae slightly longer than diameter of segments; frontovertex two-fifths head width; aedeagus about two-thirds as long as mid tibia, digiti moderately elongate and each with a single apical hook.

HOSTS. Recorded below as a parasitoid of the eggs of *Rondotia menciana* (Lepidoptera: Bombycidae).

DISTRIBUTION. P.R China.

MATERIAL EXAMINED. Type material. Holotype ♀, P.R. CHINA: Zejiang, Wuxing, ex eggs of *Rondotia menciana* Moor, v.1956 (Fuqi Zhang) (IZAS). Paratypes, 9♀, 3♂, same data as holotype (IZAS, BMNH).

Non type material. A further 40 unmounted specimens in poor condition, but with same data as type material (IZAS).

COMMENTS. *Ooencyrtus hercle* is close to *corbetti* and can be separated from this species by its smaller size, relative proportions of funicle segments and wider frontovertex in the female.

Ooencyrtus corbetti Ferrière

(Figs 64–66)

Ooencyrtus corbetti Ferrière, 1931: 284. LECTOTYPE ♀ (here designated), Malaysia (BMNH, examined).

DIAGNOSIS. Body including gaster black, weakly metallic; interantennal prominence purple; scutellum coppery in basal half, its apical half weakly to strongly metallic green; legs with all coxae, femora except both base and apex black; tibiae normally totally yellow but occasionally fore tibia with a faint brown subbasal ring; scutellum (similar to Fig. 80) with fairly regular, slightly elongate, reticulate sculpture which is conspicuously deeper than that on mesoscutum, its extreme posterior margin smooth and shiny; mandible (similar to Fig. 69) with two acute teeth and a truncation; forewing (Fig. 65) with postmarginal vein a little shorter than stigmal vein. Female (0.80–1.93 mm): antennae (Fig. 64) with scape slightly expanded in the middle, about 4 times as long as broad; pedicel as long as F1–2; F1–2 subequal and hardly longer than broad, conspicuously smaller than F3–6 which are distinctly longer than broad; clava as long as F4–6 together or a little longer, its apex rounded and with sensory part limited to extreme apex only; frontovertex about one-quarter head width; ovipositor hidden, the sheaths brown; basal part of second valvifers relatively broad (Fig. 66). Male

(length about 0.8 mm): antennae with all funicle segments longer than broad, pedicel and flagellum together distinctly longer than head width; longest setae about twice as long as diameter of segments; frontovertex slightly more than two-fifths head width.

HOSTS. Reared from eggs of *Podontia quatuordecimpunctata* (Coleoptera: Chrysomelidae).

DISTRIBUTION. Malaysia.

MATERIAL EXAMINED. Type material. Lectotype ♀, MALAYSIA: Kuala Lumpur, from eggs of *Podontia 14-punctata*, 5.VII.1921, (G. H. Corbett), B.M. TYPE HYM. 5. 1,072, also with a red 'type' label. Paralectotypes, 7♀, each with a yellow 'Cotype' label, otherwise same data same as lectotype; 1♀, with a yellow 'Paratype' label, otherwise as lectotype (BMNH).

COMMENTS. *Ooencyrtus corbetti* is very close to *podontiae* and may eventually prove to be synonymous. However we have seen only limited material and for the present we prefer to retain the two as distinct because of small differences in setation at the base of the forewing (cf. Figs 65 and 70) and in the relative proportions of the antennal segments. In females of *corbetti* only F1–2 are relatively small and the clava as long as F4–6 combined, whilst in *podontiae* F1–3 are subequal and relatively small and the clava is as long as F3–6 combined.

Ooencyrtus podontiae (Gahan)

(Figs 67–73)

Schedius podontiae Gahan, 1922: 51, ♀. LECTOTYPE ♀ (here designated), Indonesia: Java (USNM, examined).

Ooencyrtus podontiae (Gahan); Ferrière, 1931: 282, 286.

DIAGNOSIS. Body including gaster black, weakly metallic; interantennal prominence purple; scutellum coppery in basal half, its apical half weakly to strongly metallic green; legs with all coxae, femora except both base and apex black; tibiae yellow; scutellum (Fig. 71) with fairly regular, slightly elongate, reticulate sculpture which is conspicuously deeper than that on mesoscutum, its extreme posterior margin smooth and shiny; mandible (Fig. 69) with two acute teeth and a truncation; forewing (Figs 70) with postmarginal vein shorter than stigmal vein. Female (0.80–1.00 mm): antennae (Figs 67, 68) with scape slightly expanded in the middle, 3–4 times as long as broad; pedicel as long as F1–2; F1–3 subequal and quadrate, F4–F6 longer than broad, subequal; clava as long as F3–6, its apex rounded and with sensory part limited to extreme apex only; frontovertex about one-quarter head width; ovipositor hidden to slightly exserted, the sheaths brown; basal part of second valvifers relatively broad (Fig. 72); hypopygium as in Fig. 73. Male (length about 0.8 mm): antennae with all funicle segments longer than broad, pedicel and flagellum together distinctly longer than head width; longest setae about twice as long as diameter of segments; frontovertex about two-fifths head width.

HOSTS. Reared from eggs of *Podontia quatuordecimpunctata* (Coleoptera: Chrysomelidae).

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Lectotype ♀, INDONESIA: Java, Buitenzorg, 27.XI.1919 (S. Leefmans) (USNM). Paralectotypes of *podontiae*: 7♀, same data same data as the lectotype (USNM, BMNH). The type series bears a label giving the eggs of *Podontia 14-punctata* (= *quatuordecimpunctata*) as the host, even though Gahan originally gives the host as *Podontia affinis* Grond.

Other material. INDONESIA: 1♀, Java, from same series as lectotype of *Schedius podontiae*; 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy Fog #15, 19.vii.1985; 1♀, BMNH Canopy Fog #13, 11.vii.1985. Material in USNM, BMNH

COMMENTS. *Ooencyrtus podontiae* is close to *corbetti*, *plautus* and *pindarus* (see comments under those species).

Ooencyrtus pindarus sp.n.

(Figs 74–82)

DIAGNOSIS. Mandible (Fig. 75) with two teeth and a truncation; postmarginal vein a little shorter than stigmal vein. Female: body including gaster black with a weak bluish lustre on the head and mesoscutum, this stronger on face, interantennal prominence purple; scutellum coppery basally, apically metallic green to purple at extreme apex; legs with all coxae and femora blackish; tibiae yellow but partly dark brown; head triangular in side view; antennae (Fig. 76) with scape subcylindrical, F1–2 subequal and transverse, conspicuously smaller than F3–6; clava slightly longer than F4–6 together, sutures parallel, apex rounded and sensory area limited to extreme apex only; frontovertex one-quarter head width; eyes as long as broad, or broader; scutellum (Fig. 80) with relatively deep longitudi-

nally reticulate sculpture, only its extreme posterior margin smooth; ovipositor hidden or very slightly exserted. Male: generally similar to female, but body much duller, dark purplish brown or blackish with hardly a metallic sheen, legs slightly darker; antenna (Fig. 82) with all funicle segments slightly longer than broad and clothed in setae, the longest of which are a little longer than diameter of segments.

FEMALE. Length 0.65–0.85 mm, (holotype 0.76 mm).

Head in ocellar area blackish, faintly purple, anterior to this weak metallic blue, between scrobes and eyes blue or green, interantennal prominence purple; antennae with radicle, scape and pedicel dark brown, flagellum testaceous; pronotum, mesoscutum and axillae blackish with a slight metallic blue tinge; scutellum dark coppery purple in basal half or so, apex and sides metallic green, extreme apex purple; mesopleuron black; propodeum blackish; legs with coxae and femora black; apices of femora yellowish; fore tibia yellow, medially dark brown; mid and hind tibia each with a subbasal dark brown ring; wings hyaline, venation testaceous; gaster black with metallic blue sheen; ovipositor sheaths dark brown.

Head in ocellar area with fine, raised reticulate sculpture; sculpture on genae longitudinally elongate; ocelli forming about a 45° angle; posterior ocelli separated from occipital margin by their own lengths and slightly separated from eye margins; frontovertex one-quarter head width; eyes not conspicuously hairy, very large, as long as broad or broader; occipital margin rounded; head in front view (Fig. 74) slightly broader than long, almost triangular in side view, quite similar in shape to species of *Adelencyrtus* and related genera; torulus separated from mouth margin by less than its own length; antennae (Fig. 76) with pedicel plus flagellum about as long as head width; pedicel slightly longer than F1–2 together which are subequal and transverse and conspicuously smaller than F3–6; clava slightly longer than F4–6 together, sutures parallel and apex rounded with sensory area restricted to extreme apex only; mandible (Fig. 75) with two teeth and a truncation. Relative measurements (holotype): head width 30, head height 27, minimum frontovertex width 7.5, POL 3, OPL 2.5, OOL 0.5, eye length 18, eye width 17, malar space 10, scape length 11, scape width 2.5; other proportions of the antennae as in Fig. 76.

Mesoscutum with shallow imbricate sculpture; scutellum (Fig. 80) with deeper, more or less uniform, longitudinally reticulate sculpture, only its posterior margin smooth, its apex pointed; fore wing with venation and distribution of setae basally as in Fig. 77. Relative measurements (holotype): forewing length 70, forewing width 28; hindwing length 48; hindwing width 10.

Gaster acute apically with ovipositor (Fig. 78) hidden or very slightly exserted, hypopygium as in Fig. 81. Relative measurements (paratype): ovipositor length 98, gonostylus 20 [mid tibia 69].

MALE. Similar to female but differs as follows. Body generally dark purplish brown or blackish, hardly metallic; legs slightly darker; head in side view more or less evenly rounded anteriorly; frontovertex one-third head width; antennae (Fig. 82) with all funicle segments longer than broad and clothed in relatively long setae; genitalia (Fig. 79) with aedeagus about half as long as mid tibia.

VARIATION. Very little in material available, but in females the tibiae may be largely dark brown in basal half or only with a narrow dark brown ring; in the males the tibiae may be more or less completely dark brown or testaceous-yellow in apical half.

HOSTS. Reared from eggs of *Plesispa reichei* (Coleoptera: Chrysomelidae).

DISTRIBUTION. Malaysia, Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Java, Selangor (? – see comments below), Mojoagung, from eggs of *Plesispa reichei*, 19.vii.1989, CIE 20619 (Wornoto) (BMNH). Paratypes, MALAYSIA: 30♀, same data as holotype; 39♀, 6♂, Penang I. to Melaka, ex eggs of *Plesispa reichei*, 13–27.xii.1990 (R. & L. Burkhart); 15♀, 6♂, Sumatra, ex eggs of *Plesispa reichei*, 11.1936 (R. Aurbowo); 7♀, Sulawesi, ex eggs of *P. reichei*, 1989, CIE A20420; 2♀, Sulawesi, Manado, ex. eggs of *P. reichei*, 30.x.1989, CIE A20715. Material in BMNH, BPBM, IZAS, PPRI, USNM, ZISP, QMB.

COMMENTS. We are unable to localise the series from which the holotype is designated. The label on the specimens reads both Java and Selangor which cannot be correct since Selangor is part of Malaysia and not Indonesia. International Institute of Entomology (= CIE) records specify that the material was originally collected in Indonesia. However we are unable to find anywhere called Mojoagung in Indonesia, although there is an island called Mojo near Sumbawa to the east of Java.

Ooencyrtus pindarus is very close to *corbetti*

and *podontiae* but can be separated by the head of the female being distinctly triangular in side view, the broad eyes and the tibiae being largely dark brown. In the other species the head is more or less evenly curved anteriorly in side view, the eyes are clearly longer than broad and the tibiae are entirely yellow or nearly so. The head shape in *pindarus* is very probably a function of the shape of its host, the egg of *P. reichei* being flattened and elongate. This would produce adult parasitoids with a depressed body, triangular head and relatively broad eyes. This suggests that the above material may be only a host-induced form of *podontiae*. However, the consistent differences in leg coloration and overlapping ranges lead us to believe that the material must belong to a distinct species.

Ooencyrtus plautus sp.n.

(Figs 83–88)

DIAGNOSIS. Body including gaster black, weakly metallic blue on head and mesoscutum; legs with coxae and femora brown; tibiae yellow but with a distinct subbasal brown ring; antennae (Figs 83, 88) of both sexes with scape slightly expanded in middle; scutellum (similar to Fig. 80) with relatively deep elongate-reticulate sculpture only the extreme posterior margin smooth; mandible (similar to Fig. 75) with two teeth and a truncation. Female: antenna with F1–3 subequal and subquadrate, conspicuously smaller than F4–6; clava about as long as F3–6 together; frontovertex about one-quarter head width; ovipositor hidden or hardly exserted. Male: frontovertex about one-third head width; all funicle segments at least about 2 times as long as broad and with longest setae about 4 times the diameter of any segment, otherwise similar to female.

FEMALE. Length 0.65–0.8 mm (holotype 0.70 mm).

Head blackish, weakly metallic in ocellar area, face and genae weakly metallic green, interantennal prominence purplish; antennae with radicle, scape except distal end and pedicel dark brown or blackish, flagellum testaceous; pronotum and axillae blackish with a very slight purple tinge; mesoscutum similar but bluish; scutellum basally black with purple-brown sheen, its apex and sides narrowly metallic green, the extreme apex purple; mesopleuron dark brown tinged purple; legs with coxae and femora dark brown; apices of femora yellowish; tibiae yellow, with a subbasal brown ring; wings hyaline, venation testaceous; gaster black with slight bluish sheen; ovipositor sheaths dark brown.

Head in lateral view not triangular and more or less evenly curved anteriorly; ocellar area with fine, raised reticulate sculpture; genae relatively shiny and with longitudinally elongate sculture; ocelli forming a right angle, posterior ocelli separated from occipital margin by less than their own length and slightly separated from eye margins; frontovertex slightly more than one-quarter head width; eyes not conspicuously hairy, clearly longer than broad; occipital margin hardly rounded; toruli separated from mouth margin by less than their own lengths (Fig. 85); antennae (Fig. 83) with pedicel plus flagellum about as long as head width; clava with apex rounded, its sutures parallel and sensory area at extreme apex only; mandible with two teeth and a truncation. Relative measurements (holotype): head width 32, head height 30, minimum frontovertex width 9, POL 4.5, OPL 1.5, OOL 0.3, eye length 21, eye width 18, malar space 10, scape length 12, scape width 3; other proportions of the antennae as in Fig. 83.

Mesoscutum with shallow imbricate sculpture; scutellum (similar to Fig. 80) with deeper, longitudinally reticulate sculpture, only its extreme lateral and posterior margins smooth and shiny; forewing with venation and distribution of setae basally as in Fig. 84. Relative measurements (holotype): forewing length 68, forewing width 31; hindwing length 50; hindwing width 12.

Gaster with ovipositor (Fig. 86) hidden or hardly exserted, basal part of second valvifer relatively narrow and strongly curved, gonostylus about one-fifth ovipositor length; hypopygium similar to Fig. 81. Relative measurements (paratype): ovipositor length 107, gonostylus 24 [mid tibia 80].

MALE. Length 0.6–0.65 mm.

Very similar to female differing slightly in leg coloration, relative width of the frontovertex and forewing and structure of antennae and genitalia. Tibiae with subbasal brown ring relatively broad, on mid tibia nearly two thirds its length; frontovertex at least two-fifths head width; antennae (Fig. 88) with pedicel conspicuously shorter than first funicle segment, each funicle segment with very long setae around the middle, other proportions of antennae as in Fig. 88; forewing broader, about 1.9 times as long as broad; genitalia as in Fig. 87 with aedeagus a little more than half length of mid tibia.

VARIATION. Very little in material available. The frontovertex of the male varies in relative width from about two-fifths head width in larger specimens to about one-half in smaller ones.

HOSTS. Recorded below from eggs of *Papilio citri* (lapsus for *P. demoleus* Linnaeus?) and *Papilio* sp. (Lepidoptera: Papilionidae).

DISTRIBUTION. India.

MATERIAL EXAMINED. Type material. Holotype ♀, INDIA: Karnataka, Bangalore, ex. eggs of *Papilio citri*, CIE A19148, viii.1986 (BMNH). Paratypes, INDIA: 4♀, 3♂, Karnataka, Bangalore, ex *Papilio* sp., 13.vii.1987, CIE 19148. BMNH, IZAS.

COMMENTS. Females of *Ooencyrtus plautus* are similar in general appearance to those of *podontiae* and *pindarus*, all three species having the scape conspicuously expanded medially, similar antennal structure and sculpture on the scutellum. *O. plautus* can be separated from *podontiae* by the presence of distinct brown rings on the tibiae, whilst it can be distinguished from *pindarus* by the head shape in combination with the forewing venation. The head of *pindarus* is distinctly triangular in side view and the stigmal vein of *plautus* is relatively longer than that of *pindarus* (cf. Figs 77 and 84). On the other hand males of these species can be separated easily on the relative length of the setae on the flagellum and the shape of the funicle segments (compare Figs 82 and 88).

Ooencyrtus daphne sp.n.

(Figs 89–93)

DIAGNOSIS. Female: antennae with distal two-thirds of scape and distal three funicle segments whitish other segments brown; head and thorax blackish, but head with a slight metallic green sheen, frontovertex purplish, mesoscutum and scutellum with a distinct purplish lustre; all coxae and fore and mid femora dark brown; hind femora totally yellow; fore-tibia partly brown; mid and hind tibia yellow; tarsi testaceous; gaster basally both dorsally and ventrally yellow, laterally and apically dark brown; antennae (Fig. 89) with F1–3 subequal and subquadrate and smaller than F4–6 which are larger and a little longer than broad; scutellum entirely smooth except for a small triangular basal area; forewing with a median cloudy band (Fig. 90); ovipositor characteristic (Fig. 93), very broad and much shorter than mid-tibia, hypopygium produced apically in the form of a short tongue, or mucro (Fig. 92), which reaches apex of gaster. Male: unknown.

FEMALE. Length about 0.8–0.9 mm (holotype 0.8 mm).

Head black, in ocellar area and interantennal prominence with a metallic purplish tinge; occipital, scrobal area and genae with a distinct metallic blue-green tinge; antennae with radicle and proximal one-third of scape blackish, distal two-third of scape pale yellow, pedicel and F1–2 or F3 brown, F4–6 whitish, clava brown; dorsum of thorax purplish reflection, scutellum a little brighter than mesoscutum; mesopleuron and propodeum dark brown; coxae concolorous with mesopleuron; fore and midfemora dark brown; hind femora totally yellow; fore tibia proximally brown, distal half yellow; mid and hind tibia yellow; tarsi testaceous-orange; forewing with a cloudy band across middle (Fig. 90); gaster anteriorly yellow both dorsally and ventrally, laterally and apically dark brown; ovipositor sheaths dark brown.

Head with fine, regularly reticulate sculpture in ocellar area, sculpture on genae longitudinally elongate; ocelli forming a slightly acute angle, the posterior ocelli separated from occipital margin by less than their own lengths and conspicuously separated from eye margins; frontovertex about one-quarter head width; eyes fairly conspicuously hairy; antennae inserted just below the ventral eye margin, toruli separated from mouth margin by less than their own lengths; antennae (Fig. 89) with pedicel plus flagellum about as long as head width; pedicel a little longer than following two segments together; F1–F3 slightly transverse, F5–F6 at least slightly longer than broad, subquadrate; clava about as long as F2–6 together, the outer suture hardly oblique and the apex with a very short oblique apical truncation, the sensory area relatively small and limited to apex only; mandibles (Fig. 91) with three teeth, but the third, upper tooth somewhat truncate. Relative measurements (holotype): head width 38, head height 36, minimum frontovertex width 10, POL 6, OPL 2, OOL 1, eye length 26 eye width 20, malar space 10, scape length 16, scape width 3; other proportions of the antennae similar to Fig. 89.

Mesoscutum with shallow imbricate sculpture; scutellum entirely smooth but for a small rugulose trianglar area at base, its apex broadly rounded; forewing with venation and distribution of setae basally as in Fig. 90, costal cell relatively narrow and linea calva open posteriorly. Relative measurements (holotype): forewing length 86, forewing width 36, hindwing length 60, hindwing width 14.

Gaster with ovipositor hidden or slightly exserted; ovipositor (Fig. 93) very broad, robust, gonostylus robust, sharply tapering towards tip and about one-quarter as long as ovipositor; hypopygium (Fig. 92) with a short, median,

apical projection which reaches the apex of the gaster. Relative measurements (paratype): ovipositor length 58, gonostylus 15 [mid tibia 79].

MALE. Unknown.

VARIATION. There is some variation in the coloration of the antennal segments. In the holotype only F1–2 are brown, whereas in the paratypes F1–3 are distinctly brown.

HOSTS. Unknown.

DISTRIBUTION. Brunei, Malaysia.

MATERIAL EXAMINED. Type material. Holotype ♀, BRUNEI: Ulu Temburong, 300m. ii–iii.1982 (M. Day) (BMNH). Paratypes, BRUNEI: 1♀, Bukit Sulang nr. Lamunin, BM 1982–388, 20.viii–10.ix.1982 (N.E. Stork); MALAYSIA: 1♀, Mt Kinabalu NP, Poring Hot Springs, 490m, BM 1991–85, 20.viii.1988 (A. Smetana). Both paratypes in BMNH.

COMMENTS. *Ooencyrtus daphne* and *flavipes* belong to the same species group which was given separate generic status by Timberlake as *Xesmatia*. The group is characterised by tridentate mandibles with upper tooth rounded or truncate, smooth shiny scutellum, relatively robust ovipositor and extended hypopygium which reaches apex of gaster. The structure of the ovipositor and hypopygium are unique within *Ooencyrtus* but we do not believe that these differences require the recognition of *Xesmatia* as a distinct genus because it is highly likely that these two species represent only a derived lineage within *Ooencyrtus*.

Ooencyrtus daphne can be separated from *flavipes* by having all coxae dark brown and a cloudy band across the forewing. In *flavipes* at least the hind coxae are yellow, the wings are completely hyaline and the marginal-postmarginal vein has only two long setae.

Ooencyrtus flavipes (Timberlake)

(Figs 94–102)

Xesmatia flavipes Timberlake, 1920: 425–428, ♀. Holotype ♀, Hawaiian Is. (BPBM, examined).
Ooencyrtus flavipes (Timberlake); Noyes & Hayat, 1984: 309.

DIAGNOSIS. Female (length: 0.48–1.03 mm): antennae with scape yellow to testaceous, flagellum normally bicolorous, clava brown and funicle segments testaceous, occasionally unicolorous brown; head and thorax blackish, but head with a slight metallic green sheen, frontovertex purplish, mesoscutum and scutellum with a distinct purplish or bluish lustre; fore coxae dark brown, mid coxae variable, hind coxae yellow; gaster normally mostly yellow with apex and sides dark brown; scutellum entirely smooth except for a small triangular, rugulose area at base; mandibles with three obtuse teeth; ovipositor robust (Fig. 100); hypopygium (Figs 101, 102) with a short median posterior projection which reaches apex of gaster; gaster mainly yellowish with dorsolateral margin brown.

VARIATION. There is some notable variation in coloration of the gaster, relative width of the frontovertex and proportions of the antennal segments. The majority of specimens have the gaster mostly yellow laterally and apically dark brown. The brown coloration may be reduced to a narrow line or more extensive, the gaster almost entirely dark brown. Larger specimens have the frontovertex relatively wider (0.4 times head width in larger specimens to 0.25 times head width in smaller ones) and longer funicle segments (compare Figs 96 and 97). There is also some variation in strength of the sculpture on the scutellum, usually most of the scutellum is completely smooth and shiny but some specimens are largely shallowly reticulate. The shape of the hypopygium varies from relatively transverse (Fig. 102) to relatively long (Fig. 101). We think that this is probably due to differences in the degree of sclerotisation of the membranous part connecting the hypopygium to the fourth gastral sternite.

HOSTS. Unknown.

DISTRIBUTION. Nepal, Thailand, Brunei, Indonesia, Hawaii.

MATERIAL EXAMINED. Type material. Holotype ♀, HAWAII: Palolo Crater, Oahu, 20.x.1918 (J.C. Bridwell, nec 20.xii.1918), with one forewing, one hindwing, one antenna and one mandible on slide (BPBM).

Other material. NEPAL: 1♀, Kathmandu, 1350m, vi.1984 (M.G. Allen); THAILAND: 1♀, Nakhon Rat Chasima, Khao Yai NP 700–800m, 11–18.iv.1990 (E. Fuller); BRUNEI: 1♀, Ulu Temburong, 300m, ii–iii.1982 (M. Day); 1♀, Bukit Sulang, Nr. Lamunin, 20.viii–10.ix.1982 (N.E. Stork); INDONESIA: 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 8.ii.1985 (BMNH Canopy Fog #3); 7♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, iv.1985 (J.S. Noyes); 6♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, v.1985 (J.H. Martin); 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, v.1985 (A. D. Austin); 4♀, Sulawesi Utara,Dumoga-Bone NP

Gunung Mogoganipa, 1000m, v.1985 (J.S. Noyes & J.H. Martin); 1♀, Sulawesi Utara, Danau Mooat (Kotomobaqu), v.1985 (J.S. Noyes); 4♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 500m, 16–23, vi.1985 (A.D. Austin); 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, vi.1985 (A.D. Austin); 4♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, 11.vii.1985, (BMNH Canopy Fog #13); 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 19.vii.1985, (BMNH Canopy Fog #15); 1♀, Sulawesi Utara, Dumoga-Bone NP, Gunung Mogogonipa, 1000m, xi.1985. Material in BMNH, IZAS, ZISP, USNM, PPRI, CNCO.

COMMENTS. *Ooencyrtus flavipes* is very close to *daphne* (see comments under *O. daphne*).

Ooencyrtus dione sp.n.

(Figs 103–105)

DIAGNOSIS. Female: head and scutellum dark brown with a distinct metallic green sheen, mesoscutum with a blue sheen, gaster purplish brown, rest of body dark brown; all coxae, fore femora and hind femora at least partly black, mid leg and all tibiae entirely yellow or nearly so; mandibles with one tooth and a very broad truncation; antennae dark brown with F5 and F6 yellow; antennae (Fig. 104) with scape extremely enlarged at middle, about 2.5 times as long as broad; flagellum strongly clavate, F1 slightly longer than broad, F2 subquadrate, F3–6 conspicuously transverse; clava conspicuously enlarged and much wider than F6, its sutures subparallel and sensory part enlarged but limited to apex only; head with frontovertex about one-quarter head width; scutellum with shallow sculpture, not deeper than that on mesoscutum or hardly so, posterior margin smooth and shiny (Fig. 105) and apex pointed; forewing with a conspicuous naked basal area (Fig. 103), with a complete row of setae on ventral side near posterior wing margin; stigmal vein long and slender, about twice as long as postmarginal vein; ovipositor hardly exserted, sheaths yellow. Male: unknown.

FEMALE. Length 1.37 mm (holotype).

Head black, with a strong metallic green sheen in ocellar area; antennal scrobes dorsally purple, lower parts of scrobes and face green, interantennal prominence coppery purple; antennal radicle and scape black, flagellum black-brown with F5 and F6 contrasting yellow; pronotum, mesoscutum and axillae black with a strong metallic blue sheen on mesoscutum; scutellum metallic green; tegulae, mesopleuron and propodeum dark brown; coxae dark brown; fore femora and proximal two third of hind femora dark brown; base and apical one third of hind femora yellow, mid legs yellow; fore tibiae with a faint dark brown subbasal ring; hind tibiae yellow; wings hyaline, venation testaceous-yellow; gaster dark purple-brown with a metallic blue sheen on basal tergites; ovipositor sheath yellow.

Head in ocellar area with regular, raised reticulate sculpture; sculpture on post ocellar area transverse; lower face and genae more shiny than frontovertex, sculpture longitudinally elongate; ocelli forming a slightly acute angle; posterior ocelli separated from occipital margin by about their own lengths and distinctly separated from eye margins; frontovertex a little more than one-quarter head width; eyes inconspicuously hairy; occipital margin slightly rounded; antennae hardly inserted below ventral eye margins; toruli separated from mouth margin by less than their own lengths; antennae (Fig. 104) with pedicel plus flagellum 0.9 times head width; scape extremely enlarged at middle, about 2.5 times as long as broad; flagellum strongly clavate; clava distinctly broader than F6, its sutures subparallel and sensory area at apex only; mandibles with one tooth and a broad truncation (similar to Fig. 213). Relative measurements (holotype): head width 58, head height 51, minimum frontovertex width 17, POL 8.5, OPL 4, OOL 1.5, eye length 35, eye width 26, malar space 20, scape length 22, scape width 9; other proportions of antennae as in Fig. 104.

Mesoscutum with shallow, fine, more or less polygonally reticulate or imbricate sculpture; sculpture on scutellum similar but gradually becoming shallower towards apex and sides so that apex is completely smooth and shiny and pointed (Fig. 21); forewing with venation and distribution of setae basally as in Fig. 103; stigmal vein long and slender, about twice as long as postmarginal vein. Relative measurements (holotype): forewing length 105, forewing width 46; hindwing length 72; hindwing width 18.

Gaster shorter than thorax; ovipositor (similar to Fig. 24) hardly exserted, with gonostylus about one-sixth as long ovipositor; hypopygium similar to Fig. 25. Relative measurements (paratype): ovipositor length 63, gonostylus 10.5 [mid tibia 52].

MALE. Unknown.

HOSTS. Reared from the eggs of *Cricula elaezia* (Lepidoptera: Saturniidae).

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Java, Pekalongen, Cinchona Plantation, ex *Cricula elaezia*, iii.1975 (M. Eddy) (BMNH). Paratypes: 1♀, same data as holotype (BMNH).

COMMENTS. *Ooencyrtus dione* can be separated from other species of the genus by the broadly flattened scape, bicolored flagellum and enlarged clava.

Ooencyrtus dryas sp.n.

(Figs 106, 107)

DIAGNOSIS. Female: body blackish with a weak metallic sheen on head and dorsum of thorax; radicle blackish, rest of antennae whitish; all coxae and hind femora dark brown, blackish; remainder of legs white or yellow; forewing with a slightly oblique, median infuscate band (Fig. 107); mandibles with one small tooth and broad truncation; antennae with F1–F5 distinctly longer than broad, F6 subquadrate or somewhat transverse; clava obliquely truncate at apex (similar to Fig. 16), with sensory area enlarged; frontovertex one-quarter head width and narrowing anterior to ocelli; scutellum with regular, fine, punctate-reticulate sculpture, only its posterior margin smooth; postmarginal vein very short, nearly absent; ovipositor not or hardly exserted. Male: unknown.

FEMALE. Length about 0.85–1.05 mm (holotype 1.02 mm).

Frontovertex weakly metallic green; lower face including interantennal prominence and genae weakly metallic purple; antennae white except radicle blackish; sometimes clava yellowish; pronotum, mesoscutum, axillae and scutellum blackish with weak purplish tinge; scutellum dull, posterior margin smooth and purplish; mesopleuron and propodeum black-brown; coxae concolorous with mesopleuron, mid and fore femora white, hind femora totally blackish, all tibiae white, all tarsi yellow; forewing with an oblique, median infuscate band; gaster dark purple brown, basal tergites slightly metallic green or blue; ovipositor sheaths yellowish.

Ocellar area with fine, regular, polygonal sculpture; sculpture on genae longitudinally elongate; ocelli forming an acute (about 50°) angle, posterior ocelli separated from occipital margin by about 2.5 times their own lengths and nearly touching eye margins; frontovertex one-quarter head width or less, the inner eye margins slightly convergent anterior to ocelli; eyes inconspicuously hairy; occipital margin hardly rounded; head in facial view as broad as long; antennae inserted distinctly below the ventral eye margins, toruli separated from mouth margin by about their own lengths; clypeus with lower margin slightly protruding; antennae similar to Fig. 16, with pedicel plus flagellum about 1.3 times head width; pedicel as long as following two segments together; F1–5 distinctly longer than broad, F6 quadrate, or somewhat transverse; clava slightly longer than F4–6 combined, obliquely truncate at apex, with sensory area enlarged and extending along whole of truncate area, nearly half length of clava; mandibles robust, with one small tooth and a broad truncation which is minutely denticulate. Relative measurements (holotype): head width 40, head height 40, minimum frontovertex width 10, POL 4.5, OPL 7.5, OOL 0.5, eye length 27 eye width 23, malar space 16, scape length 19, scape width 3; other proportions of antennae similar to Fig. 16.

Mesoscutum with shallow, imbricate sculpture; scutellum with conspicuously deeper, fine punctate-reticulate sculpture (Fig. 106), only posterior margin smooth and shiny, and apex moderately pointed; forewing with venation and distribution of setae basally as in Fig. 107; costal cell narrow; linea calva closed posteriorly; postmarginal vein very short, almost absent. Relative measurements (holotype): forewing length 94, forewing width 38, hindwing length 65, hindwing width 14.

Gaster about as long as thorax or shorter; ovipositor (similar to Fig. 335) more or less hidden; hypopygium similar to Fig. 36. Relative measurements (paratype): ovipositor length 83, gonostylus 17 [mid tibia 105].

MALE. Unknown.

VARIATION. Very little in material available, other than that described above under colour.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, 450m, BMNH Canopy fog #5, 2.ii.1985 (BMNH). Paratypes, INDONESIA: all same data as holotype but 1♀, BMNH Canopy #3, 8.ii.1985; 3♀, BMNH Canopy #11, 10.iii.1985; 3♀ iv.1985 (J.S. Noyes); 1♀, v.1985 (J. Martin); 2♀, BMNH Canopy #13, 11.vii.1985; 1♀, BMNH Canopy fog #15, 19.vii.1985. Material in BMNH, IZAS, MZB.

COMMENTS. Females of *Ooencyrtus dryas* can de

distinguished from other species of the genus by the almost totally white antennae and legs contrasting with the rest of the body, infuscate forewings, obliquely truncate clava and eyes converging anterior to the ocelli.

Ooencyrtus ceres sp.n.

(Figs 108–112)

DIAGNOSIS. Body blackish, head and dorsum of thorax dorsally metallic blue or green; scutellum more strongly metallic than mesoscutum; all coxae black, femora usually brown on sides, otherwise yellow; tibiae yellow; mandibles with one tooth and a broad truncation; anterior three-fifths of scutellum with regular, fine punctate-reticulate sculpture, posterior part smooth and shiny (Fig. 109). Female: antennae (Fig. 108) with funicle dark testaceous and clava yellow; frontovertex less than one-quarter head width; all funicle segments longer than broad; clava hardly broader than funicle segments, its sutures parallel and sensory area small and at apex only; forewing (Fig. 110) with linea calva closed posteriorly; ovipositor not exserted or hardly so. Male: similar to female but antennae unicolorous testaceous-yellow; all funicle segments at least twice as long as broad and clothed in setae about twice as long as diameter of segments; frontovertex about one-third head width.

FEMALE. Length about 0.8–1.05 mm (holotype 0.8 mm).

Head blackish with a green or purple sheen on frontovertex; the face, interantennal prominence and genae green, more metallic; lowest margins of toruli connected by a very narrow, broadly u-shaped line; antennae with radicle, dorsal sides of pedicel and funicle segments dark testaceous, ventral sides of pedicel and funicle segments testaceous, scape and clava yellow; pronotum, mesoscutum and axillae blackish with a metallic green or blue sheen; scutellum metallic green mixed with some blue, clearly brighter than mesoscutum, posterior two-fifths very shiny and with a purplish sheen; mesopleuron and propodeum dark brown; coxae, dorsal and ventral sides of femora blackish, trochanters, apices of femora, tibiae and tarsi yellow, pretarsi brown; wings hyaline, venation testaceous; gaster blackish with a slight metallic green sheen dorsally; ovipositor sheaths dark brown.

Head in ocellar area with fine, shallow, polygonally reticulate sculpture; reticulate sculpture on genae longitudinally elongate; ocelli forming an angle of about 60°, posterior ocelli separated from occipital margin by about 2 times their own length and almost touching eye margins; frontovertex less than one-quarter head width; eyes not conspicuously hairy; occipital margin hardly rounded; antennae inserted slightly below the ventral eye margins (Fig. 111), toruli separated from mouth margin by more than their own lengths; clypeal margin slightly produced medially (Fig. 111); antennae (Fig. 108) with all funicle segments conspicuously longer than broad, clava about as long as F4–6 together, sutures parallel and sensory area at extreme apex only; mandibles (similar to Fig. 333) with one teeth and a broad, minutely denticulate truncation. Relative measurements (holotype): head width 41, head height 36, minimum frontovertex width 10, POL 4, OPL 5, OOL 0.5, eye length 26, eye width 21, malar space 15, scape length 19, scape width 4.5; other proportions of antenna as in Fig. 108.

Mesoscutum with shallow, imbricate sculpture; scutellum (Fig. 109) with conspicuously deeper, fine, punctate-reticulate sculpture in anterior three-fifths, posterior two-fifths smooth and very shiny; fore wing with venation and distribution of setae basally as in Fig. 110; linea calva closed posteriorly. Relative measurements (holotype): forewing length 100, forewing width 38; hindwing length 65; hindwing width 15.

Gaster shorter than thorax; ovipositor (similar to Fig. 335) not or hardly exserted, hypopygium as in Fig. 112. Relative measurements (paratype): ovipositor length 102, gonostylus 19 [mid tibia 95].

MALE. Length: 0.85 mm. Generally very similar to female but for antennae, wider frontovertex, coloration of legs and structure of genitalia. Antennae testaceous-yellow, slightly darker proximally; mid-femora entirely yellow; frontovertex about one-third head width; antennae with pedicel plus flagellum about 1.5 times as long as head width; F1, F5 and F6 equal in length, subequal to pedicel, each 2 times as long as broad; F2–4 subequal in length and slightly longer than other segments; clava about 3.5 times as long as broad, as long as two proceeding segments together; funicle clothed in setae about 2 times as long as diameter of segments.

VARIATION. Very little in material available.

HOSTS. Reared from eggs of *Cratoplatys* sp. (Heteroptera: Plataspidae).

DISTRIBUTION. Brunei, Malaysia.

MATERIAL EXAMINED. Type material. Holotype ♀, MALAYSIA: Sabah, Tawau, ex eggs of *Cratoplatys* sp., CIE A18090, 11.vi.1986

(G.T.Lim) (BMNH). Paratypes, MALAYSIA: 1♀, 1♂, same data as holotype; BRUNEI, 2♀, Bukit Sulang, Nr. Lamunin, B.M. 1982–388, 20.viii–10.ix.1982 (N.E. Stork) (BMNH).

COMMENTS. Females of *Ooencyrtus ceres* can be separated from other species of the genus by the unique combination of a bicolorous flagellum, finely punctate-reticulate scutellum which is shiny in posterior two-fifths, filiform antennae with all funicle segments longer than broad and generally yellow legs with femora normally margined brown (see also comments under *ilion*, *iris*, *elissa* and *bacchus* below).

Ooencyrtus ilion sp.n.

(Figs 113–116)

DIAGNOSIS. Female: body generally blackish, but head slightly tinged with purple and green, mesoscutum metallic blue, scutellum brighter green; antennae generally testaceous; all coxae blackish, hind femora and fore femora mainly dark brown except at apices; mid femora yellow; mandible (Fig. 114) with one very small tooth and a broad, minutely denticulate truncation; flagellum clavate (Fig. 113), all funicle segments subquadrate, F1–3 conspicuously smaller than F4–6; clava much broader than F6, sutures oblique and sensory area extending along ventral part of apical segment, about half as long as clava; frontovertex one-sixth head width; scutellum anteriorly finely punctate-reticulate, posterior one-third or less smooth and shiny; forewing (Fig. 115) with conspicuous basal naked area, linea calva open posteriorly; postmarginal vein about two-third of stigmal vein; ovipositor not exserted.

FEMALE. Length 0.9–1.0 mm (holotype 0.95 mm).

Head blackish, weakly metallic green, ocellar area slightly purple; face metallic green, interantennal prominence dorsally purple; antennae with radicle dark brown, scape yellow but marked with brown basally; pedicel mainly brownish but apex testaceous, flagellum testaceous-yellow, F1–3 and clava slightly darker; pronotum black, weakly metallic; mesoscutum and axillae blackish with strong blue or blue green metallic sheen; scutellum green, with blue reflections, apically blue, very shiny; mesopleuron and propodeum dark brown; coxae concolorous with mesopleuron, fore-femora and hind-femora mainly dark brown except for yellow apices; mid-femora totally yellow, rest of legs yellow; wings hyaline, venation testaceous; gaster black, slightly metallic green basally; ovipositor sheaths dark brown.

Head with very shallow, fine, polygonally reticulate sculpture in ocellar area; sculpture on genae longitudinally elongate; ocelli forming an acute angle of about 40°, posterior ocelli separated from occipital margin by about 1.5 times their own lengths and touching eyes; frontovertex about one-sixth head width; eyes not conspicuously hairy; occipital margin hardly rounded; antennae inserted distinctly below ventral eye margins, toruli separated from mouth margin by less than their own lengths; antennae (Fig. 113) with pedicel plus flagellum about 0.9 times head width; all funicle segments subquadrate, F1–3 somewhat transverse and distinctly smaller than following segments F4–6; clava conspicuously broader than F6, about as long as F3–F6 together, with outer suture moderately oblique, sensory area and about half as long as clava; mandibles (Fig. 114) robust, with one small tooth and a broad inner, minutely denticulate truncation. Relative measurements (holotype): head width 47, head height 42, minimum frontovertex width 8, POL 3, OPL 4, OOL 0, eye length 30 eye width 28, malar space 17, scape length 18, scape width 4.5; other proportions of antennae as in Fig. 113.

Mesoscutum with very shallow polygonally reticulate or imbricate sculpture; scutellum with distinctly deeper, punctate-reticulate sculpture, shallower in apical one-third and with posterior one-fifth smooth, apex moderately pointed; forewing with venation and distribution of setae basally as in Fig. 115, linea calva open posteriorly. Relative measurements (holotype): forewing length 99, forewing width 41.

Gaster about two-thirds as long as thorax; ovipositor (Fig. 116) not exserted, with gonostylus only about one-sixth as long as ovipositor; hypopygium similar to Fig. 36. Relative measurements (paratype): ovipositor length 123, gonostylus 20 [mid tibia 96].

MALE. Unknown.

VARIATION. Very little in material available.

HOSTS. Reared from the eggs of *Amblypelta cocophaga* (Hemiptera: Coreidae) from coconut.

DISTRIBUTION. Solomon Islands.

MATERIAL EXAMINED. Type material. Holotype ♀, SOLOMON ISLANDS: Lunga, Guadalcanal, ex *Amblypelta cocophaga* eggs from coconut, 11.x.1937 (J.D.D. Love) (BMNH). Paratypes, SOLOMON ISLANDS: 5♀, same data as holotype; 3♀, Baunami, ex eggs of

Amblypelta cocophaga, 23.vi.1937 (J.S. Phillips). Material in BMNH, IZAS.

COMMENTS. *Ooencyrtus ilion* may be closest to *ceres*, both species having very similar habitus, general coloration and sculpture on the scutellum. *O. ilion* can be distinguished from *ceres* by having a clavate flagellum with very short segments and clava with an enlarged, oblique sensory area whilst in *ilion* the flagellum is filiform with elongate segments and the clava has a small sensory area at extreme apex only.

O. ilion is also superficially similar to *iulus* (see comments under *iulus* below).

Ooencyrtus iris sp.n.

(Figs 117–119)

DIAGNOSIS. Female: body generally dark brown or blackish, face metallic green, frontovertex slightly coppery; mesoscutum dull but slightly metallic green, scutellum anteriorly dull purplish, posterior part and sides metallic blue or green; antennae testaceous; all coxae dark brown, legs yellow but with fore and hind femora usually margined dark brown; mandibles with a small tooth and a broad, slightly convex, minutely denticulate, truncation; flagellum filiform, all funicle segments longer than broad; clava hardly broader than funicle, sutures parallel, sensory area at extreme apex only; scutellum anteriorly with shallow sculpture, posterior half more or less smooth and shiny; forewing (Fig. 119) without conspicuous basal naked area; linea calva closed posteriorly; ovipositor not exserted. Male: unknown.

FEMALE. Length about 0.85–1.05 mm (holotype 1.0 mm).

Head in ocellar area dull with a slight green and coppery sheen; face, brighter metallic green, sometimes bluish or brassy; a very thin metallic purple v-shaped line connects lowest margins of antennal toruli; antennae testaceous-yellow; pronotum, mesoscutum, axillae and anterior half of scutellum blackish with weak metallic purple or green sheen; posterior half of scutellum conspicuously metallic blue, green and purple, much brighter than anterior half; mesopleuron and propodeum dark brown; coxae concolorous with mesopleuron, legs yellow but with fore and hind femora margined dorsally and ventrally brown; wings hyaline, venation testaceous; gaster blackish with a slight metallic green sheen; ovipositor sheaths yellow.

Head in ocellar area with shallow, regular, polygonally reticulate sculpture, that on genae longitudinally elongate; ocelli forming an acute angle of about 50°, posterior ocelli separated from occipital margin by about 1.5–2 times their own lengths and almost touching eye margins; frontovertex one-fifth head width; eyes not conspicuously hairy; occipital margin slightly rounded; antennae inserted just below the ventral eye margin (Fig. 117); toruli separated from mouth margin by little more than their own lengths; clypeal margin slightly protuberant medially (Fig. 117); antennae (similar to Fig. 108) with pedicel plus flagellum 1.1 times as long as head width; all funicle segments conspicuously longer than broad, clava about as long as F4–6 together, with sutures parallel and sensory area at extreme apex only; mandibles (similar to Fig. 333) with one tooth and a slightly convex, broad, minutely denticulate truncation. Relative measurements (holotype): head width 41, head height 38, minimum frontovertex width 9, POL 4, OPL 4, OOL 0.3, eye length 28, eye width 23, malar space 15, scape length 17, scape width 3.5; other proportions of antenna similar to Fig. 108.

Mesoscutum with shallow, imbricate sculpture; scutellum basally with similar, but finer sculpture, posterior half and sides smooth, its apex rounded; fore wing with venation and distribution of setae basally as in Fig. 119. Relative measurements (holotype): forewing length 93, forewing width 37; hindwing length 60; hindwing width 14.

Gaster about as long as thorax, ovipositor (similar to Fig. 335) not exserted, with gonostylus about one-sixth as long as ovipositor; hypopygium as in Fig. 118. Relative measurements (paratype): ovipositor length 90, gonostylus 15 [mid tibia 90].

MALE. Unknown.

VARIATION. Very little in material available.

HOSTS. Unknown.

DISTRIBUTION. Papua New Guinea.

MATERIAL EXAMINED. Type material. Holotype ♀, PAPUA NEW GUINEA: Madang Prov., Laing, 20.vi.1982 (P. Grootaert) (BMNH). Paratypes, PAPUA NEW GUINEA: 1♀, same data as holotype; 1♀, same data but vii.1982; 3♀, same data but xi.1982. Material in BMNH.

COMMENTS. *Ooencyrtus iris* is probably close to *Ooencyrtus ceres*, both species having a very narrow purple line connecting the lowest margins of the toruli, more or less filiform flagellum, scutellum smooth posteriorly and linea calva closed posteriorly. *O. iris* differs from *ceres* in

having a unicolorous flagellum, anterior part of scutellum with relatively shallow imbricate sculpture and ovipositor sheaths yellow. In *ceres* the flagellum is bicolorous, the anterior part of the scutellum has relatively deep punctate-reticulate sculpture, and the ovipositor sheaths are dark brown.

The species is also close to *Ooencyrtus elissa* and *bacchus* (see comments under *elissa* and *bacchus* below).

Ooencyrtus javanicus Mercet

(Figs 120–124)

Ooencyrtus (Schedius) javanicus Mercet, 1922a: 152–153. Lectotype ♀ (designated by Noyes, 1981), Indonesia (IEEM, examined).

Ooencyrtus javanicus Mercet; Ferrière, 1931: 282.

DIAGNOSIS. Female (length about 0.8–1 mm): body generally dark brown, metallic green or blue on head, dorsum of thorax and gaster; apical half and sides of scutellum more strongly metallic blue or purplish; antennae testaceous-yellow; coxae and fore-femora mostly blackish, rest of legs yellow; tegulae dark brown; ovipositor sheaths yellow; mandibles (Fig. 121) with a small tooth and a broad truncation; frontovertex about one-quarter head width; antennae (Fig. 120) with funicle segments at most a little longer than broad, F6 distinctly transverse; clava with sensory area at apex only; anterior half of scutellum with similar shallow sculpture to mesoscutum, this becoming shallower towards apex so that posterior half is smooth; forewing (Fig. 123) with conspicuous naked area basally; ovipositor (Fig. 122) only slightly exserted, slightly longer than mid tibia; hypopygium similar to Fig. 36. Male (length 0.6–1.0 mm): similar to female but antennae and legs, including coxae, more or less completely yellow; bases of tegulae yellow; antennae (Fig. 124) with all funicle segments at least about twice as long as broad and clothed in setae about twice as long as diameter of segments; aedeagus about two-thirds as long as mid tibia.

HOSTS. Recorded from the eggs of Lepidoptera by Mercet (1922a) and recorded below from the eggs of *Cricula* sp. (Lepidoptera: Saturniidae).

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Lectotype ♀: no data other than '*Schedius javanicus*' [according to Mercet the specimen came from Indonesia, Java and was reared as an endophagous parasite of the eggs of a lepidopteran] (IEEM).

Other material. INDONESIA: 4♀, 5♂, ex eggs of *Cricula*, CIE A2125, vi.1990. In BMNH.

COMMENTS. In general habitus and coloration, especially of the legs, *Ooencyrtus javanicus* is extremely similar to *O. iulus*. The two species can be separated on the relative proportions of the marginal, postmarginal and stigmal veins and relatively more densely setose basal part of forewing in *iulus* (compare Figs 123 and 128), the yellow ovipositor sheaths of *javanicus* (brown in *iulus*) and ovipositor longer than mid tibia in *javanicus* (not longer than mid tibia in *iulus*) with longer, more slender gonostyli.

Ooencyrtus iulus sp.n.

(Figs 125–128)

DIAGNOSIS. Female: body blackish weakly purplish or green on head and pronotum, mesoscutum quite strongly metallic green, blue or purple, scutellum largely blue or purple; antennae with radicle black, remainder yellow; all coxae black, fore-femora black, rest of legs mostly yellow; mandibles with one small tooth and a broad, minutely denticulate truncation; frontovertex not more than about one-quarter head width (Fig. 127); flagellum slightly clavate; F1–4 subquadrate; clava hardly broader than F6, with sensory area slightly enlarged, but more or less restricted to apex only; scutellum anteriorly with shallow sculpture as mesoscutum, posteriorly smooth and shiny; forewing (Figs 128) without conspicuous basal naked area; linea calva open posteriorly; ovipositor not exserted. Male: coloration similar to female, but dorsum of thorax much duller, coppery purple; antennae with all funicle segments at least twice as long as broad and clothed in setae more than 2 times as long as diameter of segments; frontovertex slightly wider than one-third head width.

FEMALE. Length about 0.7–0.9 mm (holotype 0.90 mm).

Head blackish with weak metallic green or purplish sheen on frontovertex; face purplish; at least top of scrobes metallic green, but sometimes also rest of face and genae; antennae with radicle black, other segments yellow; pronotum, purplish brown; mesoscutum quite strong metallic green or blue margined purple, anterior part of scutellum relatively dull purplish, posterior part strong metallic green or blue; mesopleuron dark purple-brown; coxae concolorous with mesopleuron, fore-femora almost totally dark

brown, rest of legs yellow but hind femora sometimes with a black mark along dorsal margin; wings hyaline, venation testaceous; gaster black with a metallic green or blue sheen; ovipositor sheaths black.

Head with fine, shallow, polygonally reticulate sculpture on frontovertex; sculpture on genae longitudinally elongate; ocelli forming an equilateral triangle, the posterior ocelli separated from occipital margin by about one and half times their own lengths and almost touching eye margins; frontovertex one-fifth to nearly one-quarter head width (Fig. 127); eyes not conspicuously hairy; occipital margin hardly rounded; antennae inserted slightly below ventral eye margin, toruli separated from mouth margin by less than their own lengths; antennae (Figs 125, 126) with pedicel plus flagellum about 0.8 times head width; F1–4 subquadrate, F6, sometimes including F5 somewhat transverse; clava not conspicuously broader than F6, slightly longer than F4–6 combined with sensory area slightly enlarged and about half as long as apical segment; mandibles (similar to Fig. 139) with a small tooth and a broad, minutely denticulate truncation. Relative measurements (holotype): head width 48, head height 40, minimum frontovertex width 9, POL 5, OPL 4, OOL 0.3, eye length 28 eye width 24, malar space 15, scape length 18, scape width 4; other proportions of antennae as in Figs 125 and 126.

Mesoscutum with shallow imbricate sculpture; anterior part of scutellum with similar sculpture, posterior half smooth and shiny; forewing with venation and distribution of setae basally as in Fig. 128, without conspicuous naked area basally; linea calva open posteriorly. Relative measurements (holotype): forewing length 90, forewing width 38.

Gaster conspicuously shorter than thorax, in dorsal view nearly rounded apically; ovipositor hidden; ovipositor similar to Fig. 335; hypopygium similar to Fig. 36. Relative measurements (paratype): ovipositor length 72, gonostylus 13 [mid tibia 73].

MALE. Length 0.7 mm.

Generally similar to female but for coloration of dorsum of thorax, frontovertex width and structure of antennae and genitalia. Thorax dorsally generally slightly metallic with a coppery or brassy sheen; apex of scutellum metallic blue-green; frontovertex a little more than one-third head width with posterior ocelli distinctly separated from eye margin; antennae with pedicel plus flagellum about 1.5 times head width; all funicle segments at least 2 times as long as broad, with setae at least 2 times as long as diameter of segments, clava as F5–6 together.

VARIATION. In the female the metallic sheen on the head and thorax varies in both intensity and coloration as described above; the frontovertex varies from about one-fifth to one-quarter head width; antennae may have F1–4 distinctly longer than broad (Fig. 126), or F1–2 subquadrate (Fig. 125).

HOSTS. Recorded from the eggs of *Eocanthecona furcellata* (Hemiptera: Pentatomidae).

DISTRIBUTION. India.

MATERIAL EXAMINED. Type material. Holotype ♀, INDIA: Madras, ex egg *Eocanthecona furcellata*, CIE A 19990 (1988) (BMNH). Paratypes, INDIA: 4♀, 1♂, same data as holotype; 2♀, Tamil Nadu, 3 km. E. Manjaler Dam, 15–18.x.1979 (J.S. Noyes); 1♀, Tamil Nadu, Mangarai Forest, 28.ix.1979 (J.S. Noyes); 1♀, Karnataka, Bannerghatta N.P., 5.xi.1979 (Z. Boucek & J.S. Noyes). Material in BMNH.

COMMENTS. Females of *Ooencyrtus iulus* are similar to those of *ilion* in general habitus and coloration. The two species can be separated on the sculpture of the scutellum, the scutellum of *ilion* being punctate-reticulate basally and much deeper than that on mesoscutum, whilst that of *iulus* is relatively shallow and not deeper than that on mesoscutum. There is also a marked difference in the structure of the clava with *iulus* having only a relatively small sensory area on the clava which is restricted to the apex only, whilst that of *ilion* is very nearly half as long as the clava itself.

O. iulus is also very similar to *javanicus* (see comments under *javanicus* above).

Ooencyrtus ixion sp. n.

(Figs 129–132)

DIAGNOSIS. Female: body generally blackish; head weakly metallic blue-green, dorsum of thorax dull metallic blue-green; antennae mostly testaceous; legs with all coxae dark brown and legs mostly yellow but with hind femora and sometimes fore femora proximally testaceous-brown; frontovertex about one-third head width; mandibles with two teeth and a truncation, second tooth very short, almost absent; scutellum with sculpture similar to that on mesoscutum, towards apex almost smooth; apex of scutellum pointed; flagellum weakly clavate, almost filiform with all funicle segments only slightly longer than broad; clava slightly broader than

F6, its sutures parallel and sensory area small and at apex only; forewing (Fig. 130) with conspicuous naked basal area; linea calva open posteriorly; postmarginal vein very short, almost absent; ovipositor not or hardly exserted. Male: similar to female, but frontovertex a little more than one-third head width; antennae with all funicle segments subequal and slightly longer than broad and clothed with setae that are about as long as diameter of segments or less.

FEMALE. Length about 8.0–9.5 mm (holotype 0.9 mm).

Head blackish, weakly metallic green on frontovertex, face metallic green, dorsal part of scrobes and interantennal prominence purple; antennae with radicle brownish, scape with proximal half yellow and distal half brownish, pedicel mainly brownish but tip testaceous, flagellum testaceous; pronotum, mesoscutum, axillae and scutellum blackish with weak metallic blue-green lustre; mesopleuron and propodeum blackish; coxae concolorous with mesopleuron, fore femora yellowish, sometimes proximally brownish, hind femora with proximal two-thirds brown and distal one-third or less yellow, rest of legs yellow; wings hyaline, venation testaceous; gaster black with metallic purple tinge; ovipositor sheaths black.

Head with regular, fine, polygonally reticulate sculpture on frontovertex; sculpture on genae longitudinally elongate; ocelli relatively large and forming a right angle, posterior ocelli separated from occipital margin and eye margins by a little less than their own lengths; frontovertex about one-third head width; eyes not conspicuously hairy; occipital margin not distinctly rounded; head with genae strongly convergent towards mouth (Fig. 132); antennae inserted distinctly below ventral eye margin, toruli separated from mouth margin of face by about their own lengths; antennae (Fig. 129) with pedicel plus flagellum about as long as head width; all funicle segments only slightly longer than broad, clava slightly broader than F6, about as long as F4–6 together, sensory area at apex only; mandibles (similar to Fig. 143) with one tooth and a broad truncation. Relative measurements (holotype): head width 42, head height 37, minimum frontovertex width 14, POL 9, OPL 2, OOL 1.5, eye length 25 eye width 20, malar space 15, scape length 18, scape width 3.5; other proportions of antennae as in Fig. 129.

Mesoscutum with shallow imbricate sculpture; scutellum with similar sculpture basally, but becoming gradually shallower apically so that apical one-third or so is smooth; apex pointed; forewing with venation and distribution of setae as in Fig. 130, with a distinct naked basal area; linea calva open posteriorly; postmarginal vein very short, almost absent. Relative measurements (holotype): forewing length 92, forewing width 40; hindwing length 57; hindwing width 14.

Gaster conspicuously shorter than thorax; ovipositor (Fig. 131) not exserted; hypopygium similar to Fig. 25. Relative measurements (paratype): ovipositor length 123, gonostylus 20 [mid tibia 96].

MALE. Length 0.79 mm. Generally similar to female but differs in relative width of frontovertex, antennal structure and genitalia. Frontovertex a little more than one-third head width; ocelli forming an obtuse angle of about 100°; posterior ocelli separated from occipital margin by about half of their own length; antennae with pedicel plus flagellum about 1.25 times head width; pedicel and all funicle segments subequal and slightly longer than broad, clava as long as F5–6; funicle segments clothed in setae that are about as long as diameter of segments or less.

VARIATION. Female with fore-femora sometimes totally yellow.

HOSTS. Reared from the eggs of a myrmeleontid on grass (Neuroptera: Myrmeleontidae).

DISTRIBUTION. India.

MATERIAL EXAMINED. Type material. Holotype ♀, INDIA: Tamil Nadu, Padappai, ex eggs of Myrmeleontidae from grass, CIE A20314, 18.iii.1989 (BMNH). Paratypes, INDIA: 50♀, 1♂, same data as holotype (only 4 females mounted, remainder in poor condition and stored in a gelatin capsule). Material in BMNH.

COMMENTS. Females of *Ooencyrtus ixion* can be separated from other species of the genus by the frontovertex being about one-third head width, the posterior ocelli well separated from the eye margin and the virtually absent postmarginal vein of the forewing. It is superficially similar to *O. ferrierei* and the extralimital *O. pityocampae*. However both *ferrierei* and *pityocampae* have the coxae and legs totally yellow, and in *ferrierei* the gaster is largely yellow whilst in *pityocampae* the funicle segments are all clearly longer than broad and relatively much longer than *ixion*.

Ooencyrtus elissa sp.n.

(Figs 133–137)

DIAGNOSIS. Female. Body generally dark brown or blackish with head metallic green, meoscutum

weakly metallic blue-green and apical two-thirds of scutellum metallic green; antennae bicolorous, mostly testaceous-brown but clava yellow; fore and mid legs, including coxae, yellow; hind coxae black, hind legs mainly yellow; ovipositor with gonostylus pale yellow; mandibles (Fig. 137) with one small tooth and a broad, minutely denticulate truncation; flagellum filiform, F1–2 subquadrate, F3–6 larger and longer than broad; clava slightly broader than F6, with sutures subparallel and sensory part at apex only; anterior half of scutellum with sculpture very slightly deeper than that on meoscutum, remainder smooth; forewing (Fig. 135) with only a small naked basal area; frontovertex a little less than one-third head width; ovipositor not exserted.

MALE. Unknown.

FEMALE. Length about 1.08 mm (holotype).

Head blackish with a strong metallic green sheen, weaker in ocellar area, slightly brassy or bluish in scrobal area and a thin purple, u-shaped line connecting lowest margins of toruli; antennae with radicle black-brown, scape mainly yellow but narrowly margined brown; pedicel proximally brown, distally testaceous; funicle segments testaceous-brown, F4–6 ventrally yellowish; clava yellow, first segment brownish basally; pronotum, axillae and anterior one-third of scutellum black with a purple tinge; mesoscutum metallic blue; posterior half of scutellum shining metallic green; mesopleuron and propodeum dark brown; fore and mid coxae yellow, hind coxae dark brown; legs yellow but for a narrow black line along dorsal part of hind femora; wings hyaline, venation testaceous; gaster dark purple-brown with weak blue tinge basally; ovipositor with sheaths pale yellow.

Frontovertex with regular, raised polygonal sculpture, deeper in ocellar area; sculpture on lower face and genae longitudinally elongate; ocelli forming a right angle; posterior ocelli separated from occipital margin by about 1.5 times their own lengths and almost touching eye margins; frontovertex a little less than one-third head width; eyes not conspicuously hairy; occipital margin rounded; antennae inserted distinctly below ventral eye margins; toruli separated from mouth margin by slightly more than their own lengths; clypeus slightly produced medially; antennae (Fig. 134) with pedicel plus flagellum as long as head width; F1–2 subquadrate, F3–6 longer than broad, subequal in length; clava only slightly broader than F6, about as long as F4–6 together, with sutures parallel and sensory part small and at apex only; mandibles (Fig. 137) with one small tooth and a broad, minutely denticulate truncation. Relative measurements: (holotype): head width 41, head height 36, minimum frontovertex width 12, POL 6, OPL 5, OOL 0.5, malar space 16, eye length 25, eye width 20, scape length 18, scape width 3.5; other proportions of antenna as in Fig. 134.

Mesoscutum with shallow imbricate sculpture; scutellum anteriorly with hardly deeper, more polygonal sculpture becoming gradually shallower so that posterior half is almost totally smooth and shiny; apex hardly pointed; fore wing with venation and distribution of setae basally as in Fig. 135, with only a small naked basal area; linea calva conspicuously open posteriorly. Relative measurements (holotype): forewing length 95, forewing width 40; hindwing length 64; hindwing width 14.

Gaster about as long as thorax; ovipositor hidden, similar to Fig. 335 with gonostylus about one-sixth as long as ovipositor; hypopygium as in Fig. 136. Relative measurements (paratype): ovipositor length 81, gonostylus 14 [mid tibia 80].

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Thailand.

MATERIAL EXAMINED. Type material. Holotype ♀, THAILAND: Chieng Mai, vii.1984 (D. Jackson) (BMNH). Paratype, THAILAND: 1♀, 22.vii–13.viii.1984, other data same as holotype. Material in BMNH.

COMMENTS. *Ooencyrtus elissa* is closest to *Ooencyrtus ceres*, *iris*, and *bacchus*, all four species having the ventral margins of the toruli connected by a faint, thin purplish v-shaped or u-shaped line, similar mandibular structure, the clypeal margin slightly produced medially and the legs largely yellow sometimes with the hind femur dorsally margined blackish. Apart from the characters which separate these species in the key, *elissa* can be distinguished from *ceres* by the relatively shallower sculpture at the base of the scutellum (in *ceres* it is relatively deep and punctate-reticulate), relatively shorter funicle segments (in *ceres* all at least about 1.5 times as long as broad) and yellow ovipositor sheaths (blackish in *ceres*). *O. elissa* differs from *iris* in having a bicolorous flagellum (unicolorous testaceous in *iris*) and relatively shorter funicle segments (all clearly longer than broad in *iris*). See also comments under *bacchus* and *pilosus* (below).

Females of *elissa* are superficially similar to *egeria* but have the ovipositor sheaths pale yel-

low, antenna with F1–2 subquadrate, forewing with a relatively elongate postmarginal vein and regular, polygonally reticulate sculpture on the anterior part of the scutellum. *O. egeria* has the ovipositor sheaths black, antenna with F1–2 distinctly longer than broad, the postmarginal vein virtually absent and longitudinally elongate sculpture on the scutellum anteriorly. *O. elissa* is also similar to the extralimital *O. dipterae* (Risbec) but can be separated by the coloration of legs, density of setae at the base of the forewing and relative proportions of the antennal segments.

Ooencyrtus egeria sp.n.

(Figs 138–140)

DIAGNOSIS. Body generally blackish, head and dorsum of thorax with a weak purple sheen, apex of scutellum metallic green; antennae except radicle yellow-testaceous; fore coxae yellow, other coxae dark brown; hind femora mainly brown, rest of legs yellow; ovipositor sheaths black; mandibles with one small tooth and a broad truncation; flagellum filiform; all funicle segments longer than broad; clava not or hardly broader than F6, the sutures parallel with sensory area slightly enlarged but at apex only; forewing (Fig. 140) with setae very fine, costal cell almost naked; postmarginal vein very short, almost absent; scutellum with longitudinally elongate reticulate sculpture anteriorly, and smooth in posterior one-quarter; apex moderately rounded; frontovertex a little less than one-third head width; ovipositor not exserted.

FEMALE. Length about 1.10 mm (holotype).

Head blackish with weak purple sheen; antennae with radicle dark brown, the remainder testaceous-yellow; pronotum, mesoscutum, axillae and anterior three-fourths of scutellum blackish with a weak purple tinge; posterior one-quarter of scutellum metallic green and much brighter than anterior part; mesopleuron and propodeum blackish with a purple sheen; legs with mid and hind coxae dark brown, hind femora brown and remainder yellow; wings hyaline, venation testaceous; gaster black with a weak blue or purple sheen; ovipositor sheaths black.

Head with fine, regular, polygonally reticulate sculpture on frontovertex; sculpture on lower face and genae longitudinally elongate; ocelli forming an equilateral triangle; posterior ocelli separated from occipital margin by about their own lengths and almost touching eye margins; frontovertex a little less than one-third head width; eyes not conspicuously hairy; occipital margin rounded; antennae inserted below the ventral eye margins; toruli separated from mouth margin by about their own lengths; antennae (similar to Fig. 148) with pedicel plus flagellum as long as head width; all funicle segments conspicuously longer than broad, subequal in length; clava as broad as funicle segments, about as long as F4–6, with sutures parallel and sensory part slightly enlarged but only at extreme apex; mandibles (Fig. 139) with one small tooth and a broad straight truncation. Relative measurements (holotype): head width 40, head height 35, minimum frontovertex width 12, POL 6, OPL 3.5, OOL 0.5, eye length 25, eye width 20, scape length 17, scape width 2.5; other proportions of antennae similar to Fig. 148.

Mesoscutum with shallow, imbricate, almost polygonal sculpture; scutellum with very slightly deeper, longitudinally elongate sculpture in anterior three-quarters, this gradually becoming shallower posteriorly so the posterior quarter smooth and shiny; apex rounded; fore wing with venation and distribution of setae basally as in Fig. 140, setae very fine, costal cell almost naked, linea calva open posteriorly; postmarginal vein nearly absent. Relative measurements (holotype): forewing length 80, forewing width 36; hindwing length 59; hindwing width 12.

Gaster about as long as thorax; ovipositor not exserted, similar to Fig. 335; hypopygium similar to Fig. 298. Relative measurements: ovipositor length 99, gonostylus 19 [mid tibia 112].

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. India.

MATERIAL EXAMINED. Type material. Holotype ♀, INDIA: Delhi, 11–18.v.1985 (J. LaSalle). Paratype, 1♀, same data as holotype. Material in BMNH.

COMMENTS. See the comments under *Ooencyrtus elissa* (above).

Ooencyrtus erebus sp.n.

(Figs 141–147)

DIAGNOSIS. Female: body generally dark brown or blackish, frontovertex weakly metallic purplish, mesoscutum bluish and scutellum contrasting coppery purple margined green at apex and sides; antennae generally testaceous; legs yellow, but mid and hind coxae black; ovipositor sheaths brown; mandibles (Fig. 143) with two teeth and a truncation; frontovertex about one-quarter head

width; flagellum (Figs 141, 142) filiform, generally F1–F5 longer than broad, F6 subquadrate; clava hardly broader than F6, its sutures parallel, sensory area small, at extreme apex only; scutellum (Fig. 146) with shallow sculpture as mesoscutum or shallower; extreme apex and sides smooth and shiny, delimited by a shallow carina; apex of scutellum rounded, sometimes slightly produced (Fig. 146); forewing (Figs 147) with a distinct naked basal area; ovipositor hardly exserted. Male: generally similar to female but antennae yellow, face shining green; antennae with all funicle segments except F1 at least 2 times as long as broad, F1 shorter; setae on flagellum at least 2 times as long as diameter of segments; frontovertex a little more than one-third head width.

FEMALE. Length about 0.80–1.15 mm (holotype 0.92 mm).

Head blackish, weakly shining purplish on frontovertex; face greenish but with interantennal prominence quite metallic purple; radicle dark brown, rest of antenna testaceous or testaceous yellow occasionally with clava conspicuously darker; pronotum and axillae purplish; mesoscutum shining green or blue-green; scutellum shining coppery purple with margins and sides metallic green; mesopleuron dark purplish brown; propodeum black; legs completely yellow but with mid and hind coxae dark brown; wings hyaline, venation testaceous, marginal vein brown; gaster black with weak green and purple sheen; ovipositor sheaths brown.

Head with shallow, regular, polygonally reticulate sculpture on frontovertex; lower face and genae with shallower, longitudinally elongate sculpture; ocelli forming an approximately equilateral triangle; posterior ocelli separated from occipital margin by a little more than their own lengths and conspicuously separated from eye margins; frontovertex about one-quarter head width; eyes not conspicuously hairy; occipital margin sharp; antennae inserted well below the ventral eye margins; toruli separated from mouth margin by a little less than their own lengths; antennae (Figs 141, 142) with pedicel plus flagellum about 1.1 times as long as head width; F1–5 conspicuously longer than broad, F6 subquadrate; clava hardly broader than F6 and nearly as long as F3–6 together, with sutures parallel and sensory area small and limited to extreme apex only; mandibles (Fig. 143) with two teeth and a truncation. Relative measurements (holotype): head width 35, head height 31, minimum frontovertex width 9, POL 4, OPL 3, OOL 1, eye length 22, eye width 18, scape length 16, scape width 3, malar space 12; other proportions of antennae as in Fig. 142.

Mesoscutum with shallow imbricate sculpture; scutellum (Fig. 146) with similar sculpture basally but becoming shallower towards sides and apex, laterally more elongate; extreme sides and apex of scutellum smooth and polished, clearly separated by a shallow carina or impression, apex more or less rounded; forewing with venation and distribution of setae basally as in Figs 144 and 147, with a distinct naked basal area with only a few setae posteriorly on ventral surface of basal cell; linea calva closed posteriorly or nearly so (Figs 144, 147). Relative measurements (paratype): forewing length 87, forewing width 35; hindwing length 60; hindwing width 12.

Gaster with ovipositor hidden or hardly exserted; ovipositor as in Fig. 145; hypopygium similar to Fig. 149. Relative measurements (paratype): ovipositor length 102, gonostylus 24 [mid tibia 75].

MALE. Length about 0.7 mm. Generally similar to female, but for coloration and structure of antennae, wider frontovertex and structure of genitalia. Antennae completely yellow; pedicel plus flagellum 1.75 times as long as head width, funicle segments subequal in length and about 2 times as long as broad except F1 which is only slightly longer than broad; flagellum clothed in setae at least 2 times as long as diameter of segments; clava a little shorter than F5–6 combined; frontovertex about two-fifths head width; ocelli forming a right angle; posterior ocelli separated from occipital margin by a little more than their own lengths.

VARIATION. In the female the coloration of the antennae, head and thorax varies as outlined above; the antennae sometimes have F1–2 quadrate and smaller than F3–6 (Fig. 141) and the linea calva is sometimes nearly closed posteriorly (Fig. 144).

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, iv.1985 (J.S. Noyes). Paratypes, 4♀, 2♂, same data as holotype; 15♀, Sulawesi Tengah, Nr Morowali, Ranu River Area, Lowland rain forest, B.M. 1980–280, iii.1980 (M.J.D. Bredell). Holotype in BMNH, paratypes in BMNH, IZAS, MZB.

COMMENTS. Females of *O. erebus* can be sepa-

rated from other species of the genus by the legs being completely yellow except for the mid and hind coxae, and the strongly contrasting metallic blue or green mesoscutum with the coppery purple scutellum.

Ooencyrtus endymion sp.n.

(Figs 148–153)

DIAGNOSIS. Female: body generally dark brown; head and dorsum of thorax metallic green; fore and mid legs almost completely yellow, hind coxae and femora brown, mid and hind tibiae each with a faint brown subbasal ring; ovipositor with gonostylus dark brown; scutellum with similar sculpture to mesoscutum, its apex slightly pointed; antennae with radicle, scape and pedicel dark brown, flagellum testaceous; flagellum more or less filiform; all funicle segments longer than broad; clava hardly not broader than F6, sutures subparallel and sensory part at extreme apex only; forewing (Fig. 153) with only a very small naked basal area; linea calva closed posteriorly; mandibles (Fig. 150) with two teeth and a truncation; frontovertex about one-quarter head width; ovipositor not exserted. Male: unknown.

FEMALE. Length about 1.11–1.13 mm (holotype 1.11 mm).

Head metallic green sometimes slightly bluish and ocellar area slightly coppery, interantennal prominence purple, but with a narrow blue line between toruli; antennae with radicle, scape and pedicel brown; flagellum testaceous; dorsum of thorax metallic green, occasionally scutellum slightly bluish; mesopleuron and propodeum dark purple-brown; legs mostly yellow, but hind coxae dark brown, hind femora brown with apices yellow, mid and hind tibia each with a narrow, faint, subbasal brown ring; wings hyaline, venation testaceous; gaster dark purple-brown with a weak green sheen; ovipositor sheaths brown.

Head with fairly regular, shallow, raised polygonal sculpture on frontovertex; lower face and genae with shallow longitudinally elongate sculpture; ocelli forming an angle of about 70–80°; posterior ocelli separated from occipital margin by about 1.5 times their own lengths and conspicuously separated from eye margins; frontovertex about one-quarter head width; eyes fairly conspicuously hairy; occipital margin hardly rounded; antennae inserted well below the ventral eye margins; toruli separated from mouth margins by about their own lengths or a little less; clypeus very slightly convex medially; antennae (Fig. 148) with pedicel plus flagellum as long as head width; F1–5 conspicuously longer than broad, F6 slightly longer than broad; clava hardly broader than F6 and a little longer than F4–6 together, with sutures parallel, sensory area slightly enlarged but at extreme apex only; mandibles (Fig. 150) normally with two teeth and a truncation, but in at least one specimen they are broadly truncate, without teeth (Fig. 151). Relative measurements (holotype): head width 52, head height 43, minimum frontovertex width 13.5, POL 8, OPL 3.5, OOL 1, eye length 30, eye width 26, scape length 22, scape width 5, malar space 17; other proportions of antennae as in Fig. 148.

Mesoscutum with shallow, regular imbricate-reticulate sculpture; scutellum with similar, but slightly deeper sculpture basally, this becoming gradually more shallow towards apex and more elongate and shallower towards sides; apex moderately pointed; forewing with venation and distribution of setae basally as in Fig. 153, with a distinct, enclosed basal naked area; linea calva closed posteriorly. Relative measurements (holotype): forewing length 135, forewing width 61; hindwing length 98; hindwing width 26.

Gaster shorter than thorax; ovipositor (Fig. 152) not exserted, or hardly so, with gonostylus about one-fifth as long as ovipositor, second valvifer proximally strongly curved; hypopygium as in Fig. 149. Relative measurements (paratype): ovipositor length 59, gonostylus 11 [mid tibia 51].

MALE. Unknown.

VARIATION. There is some variation in coloration of the head and thorax as described above with the head and scutellum having a distinct bluish lustre contrasting with the green mesoscutum. At least one of specimen from Sichuan has edentate mandibles, but this may be because the mandibles are worn. These specimens are also conspicuously smaller than those from Yunnan and consequently the antennal segments are relatively shorter.

HOSTS. Recorded from the eggs of *Dendrolimus* sp., *Dendrolimus kikuchii* (Lepidoptera; Lasiocampidae) and an unidentified sphingid.

DISTRIBUTION. P.R. China.

MATERIAL EXAMINED. Type material. Holotype ♀, P.R. CHINA: Yunnan, ex eggs of *Dendrolimus* sp., 83–1285, 28.viii.1981 (Hou Taoqian). Paratypes, P.R.CHINA: 1♀, same data as holotype; 5♀, Yunnan, Gejiu, ex eggs of *Dendrolimus kikuchii* Matsumura, 10.viii.1980 (Li

Guoxiu); 3♀, Yunnan, Honghe, ex. eggs of a sphingid (Li Guoxiu); 3♀, Sichuan, Huili, Huangxian, 2.vi.1961 (Dingxi Liao). Holotype in IZAS, paratypes in IZAS, BMNH,

COMMENTS. *Ooencyrtus endymion* is very close to *pinicolus* (Matsumura) recorded from the same host genus in the Palaearctic region. Females of *O. pinicolus* are generally much darker than *endymion* with all coxae dark brown and the rest of the legs almost completely dark brown. Most notably the frontovertex of *pinicolus* is nearly one-third head width and the linea calva is open, whereas in *endymion* the linea calva is distinctly closed and the frontovertex is about one-quarter head width. *O. endymion* is also very similar to *O. fecundus* Ferrière & Voegelé from North Africa, both species being of similar general habitus and coloration, especially the legs and dorsum of thorax. *O. fecundus* has also been recorded from the eggs of Lasiocampidae and Sphingidae (Trjapitzin, 1989). However, in *fecundus* the hind femora are completely yellow, the postmarginal vein is very short and almost absent and the linea clava is open, whereas in *endymion* the hind femora are mostly dark brown, the postmarginal vein is about two-thirds as long as the stigmal and the linea calva is closed.

Ooencyrtus hymen sp.n.

(Figs 154–158)

DIAGNOSIS. Female: head largely metallic green, lower parts of face orange; thorax orange mixed with metallic green dorsally; antennae and legs orange; gaster entirely dark brown with weak metallic reflections; forewings hyaline; ovipositor sheaths pale orange; mandible with two teeth and a narrow emarginate truncation (Fig. 155); antennae (Fig. 154) with funicle segments at most slightly longer than broad, with clava slightly enlarged about as long as F3–6 together, its apex with a very small oblique apical truncation and enlarged sensory area; frontovertex extremely narrow, narrowest anterior to ocelli and about one-seventeenth head width; posterior ocelli nearly touching, forming a very acute angle; median ocellus almost touching eyes; eyes conspicuously hairy; forewing (Fig. 156) without a conspicuous basal naked area; linea calva closed or nearly so; scutellum with similar sculpture to mesoscutum, only posterior vertical margin smooth and shiny; ovipositor very slightly exserted. Male: unknown.

FEMALE. Length 1.35 mm. (holotype 1.35 mm).

Head metallic green on frontovertex, upper scrobal area and temples, lower face including interantennal prominence and genae orange; antennae including radicle orange; thorax orange, but distinctly metallic green medially on dorsum, and on scutellum; tegulae orange; legs, including coxae, pale orange; forewing hyaline, veins testaceous; propodeum orange; gaster completely dark brown with a metallic coppery and green sheen; ovipositor sheath pale orange.

Head with very fine, polygonally reticulate sculpture on frontovertex; sculpture on genae longitudinally elongate; ocelli forming a very acute angle of about 15°, the posterior ocelli almost touching and separated from occipital margin by nearly twice their own lengths and touching eye margins; median ocellus nearly touching eyes; frontovertex, at narrowest point about mid way between anterior ocellus and top of scrobes, one-seventeenth head width; eyes conspicuously hairy; occipital margin acute, hardly rounded; head in front view (Fig. 158) nearly as broad as high; antennae inserted far below the ventral eye margins, toruli separated from mouth margin by their own lengths; antennae (Fig. 154) with pedicel plus flagellum about as long as head width; pedicel distinctly longer than F1–2 together; F1–5 subquadrate, F6 transverse, flagellum clavate; clava about as long as F3–6 together, the sutures parallel but apex with a small, slightly oblique truncation, the sensory part slightly enlarged; mandibles almost tridentate, with two teeth and a short, slightly emarginate truncation. Relative measurements (holotype): head width 53, head height 52, minimum frontovertex width 3, POL 2, OPL 5, OOL 0, eye length 41, eye width 32, malar space 18, scape length 22, scape width 4.5; other proportions of antenna as in Fig. 154.

Scutellum with very similar fine imbricate-reticulate sculpture to mesoscutum, only its posterior vertical margin smooth; forewing hyaline with venation and distribution of setae basally as in Fig. 156, without a conspicuous basal naked area and linea calva closed or nearly so. Relative measurements (holotype): forewing length 120, forewing width 50; hindwing length 74; hindwing width 19.

Gaster about as long as thorax; ovipositor (Fig. 157) very slightly exserted; hypopygium similar to Fig. 218. Relative measurements (paratype): ovipositor length 53; gonostylus 14 [mid tibia 45].

MALE. Unknown.

VARIATION. The extent of the metallic green

coloration of the mesoscutum is variable, it may be almost absent, limited to an inconspicuous area medially or it may be more extensive and covering almost the whole of the mesoscutum with only the anterior and outer margin orange as in the holotype.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, 300m, BMNH Canopy Fog #4, 8.ii.1985. Paratypes, 1♀, same data as holotype except BMNH Canopy Fog #3 and without elevation; 1♀, 450m, BMNH Canopy Fog. #5, 2.ii.1985, other data as holotype. Material in BMNH.

COMMENTS. *Ooencyrtus hymen* is very close to *belus*, females of both species having the thorax largely yellow or orange, legs completely yellow or orange, wings hyaline with linea calva closed or nearly so, narrow frontovertex, conspicuously hairy eyes and more or less uniformly sculptured scutellum. The two species can be separated by the relative size of the sensory area of the clava and by the coloration of the dorsum of the thorax (see key).

Ooencyrtus belus sp.n.

(Figs 159–165)

DIAGNOSIS. Female: head and dorsum of thorax almost entirely metallic green or blue-green, sides of thorax, antennae and legs orange; gaster completely dark brown, ovipositor sheaths pale orange; forewing hyaline; antennae (Fig. 160) filiform; funicle segments at most slightly longer than broad; pedicel plus flagellum as long as head width; clava a little longer than F3–6 together, rounded at apex and without a conspicuous sensory area; frontovertex about one-seventeenth head width, narrowest below anterior ocellus; mandible with two teeth and short truncation (similar to Fig. 155); posterior ocelli almost touching, median ocellus almost touching eyes (Fig. 159); eyes conspicuously hairy; forewing (Fig. 161) without a conspicuous naked basal area; linea calva nearly closed; scutellum with sculpture similar to that on mesoscutum, only posterior vertical margin smooth; ovipositor slightly exserted. Male: generally very similar to female but scape expanded in proximal half, flagellum white, funicle segments all transverse and clothed with setae that are not longer than diameter of segments and clava enlarged with an oblique apical truncation (Fig. 164).

FEMALE. Length (including ovipositor) 0.90–0.95 mm (holotype 0.95 mm).

Head metallic blue-green, mouth margin orange, interantennal prominence purple-blue; antennae including radicle orange; sides of thorax and legs orange, dorsum metallic green; tegulae orange; propodeum brown; gaster entirely with a coppery purple and green sheen; forewing hyaline, veins testaceous; ovipositor sheaths yellowish.

Head with fine polygonally reticulate sculpture on frontovertex; sculpture on genae longitudinally elongate; ocelli forming a very acute angle of about 15°, posterior ocelli nearly touching and separated from occipital margin by nearly twice their own lengths and touching eye margins; median ocellus nearly touching eyes (Fig. 159); frontovertex about one-seventeenth head width; eyes conspicuously hairy; occipital margin acute, hardly rounded; head in front view (Fig. 159) only slightly broader than high; antennae inserted far below ventral eye margin, toruli separated from mouth margin by less than their own lengths; antennae (Fig. 160) with pedicel plus flagellum as long as head width; pedicel distinctly longer than F1 plus F2 and slightly broader than F1; F1–4 subquadrate, F5 and F6 transverse, flagellum filiform; clava a little longer than F3–6 together, rounded at apex and without a conspicuous apical sensory area; mandible appearing almost tridentate with two teeth and a very short truncation (similar to Fig. 155). Relative measurements (holotype): head width 41, head height 39, minimum frontovertex width 2.5, POL 2, OPL 4, OOL 0, eye length 31, eye width 26, malar space 13, scape length 16, scape width 4; other proportions of antenna as in Fig. 160.

Scutellum with similar, fine, imbricate-reticulate sculpture as mesoscutum, only posterior vertical margin smooth; forewing (Fig. 161) hyaline, without a conspicuous basal naked area and linea calva posteriorly nearly closed. Relative measurements (holotype): forewing length 92 forewing width 37; hindwing length 58; hindwing width 14.

Gaster a little shorter than thorax; ovipositor (Fig. 162) slightly exserted; hypopygium as in Fig. 163. Relative measurements: ovipositor length 60, gonostylus 16 [mid tibia 35].

MALE. Length 0.72 mm. Extremely similar to female but for antennae and genitalia. Antennae (Fig. 164) with scape and pedicel yellow, flagellum white; scape expanded in proximal half; pedicel longer than proximal funicle segments

together; at most F1–F3 subquadrate, F4–F6 transverse; clava enlarged with an oblique apical truncation, and with very distinct sensory tubules on the truncate part; genitalia as in Fig. 165, with a single tooth on each digitus.

VARIATION. Very little in material available.

HOSTS. Recorded below from mealybugs (Homoptera: Pseudococcidae) on coconut, but this is almost certainly erroneous. The specimens probably originated from insect eggs mixed in with the mealybugs.

DISTRIBUTION. Philippines

MATERIAL EXAMINED. Type material. Holotype ♀, PHILIPPINES: Christensen, Plant. Hagonoy, Davao del Sur, ex mealybug on coconut, C.I.E. A16554, i.1984. Paratypes, 3♀, 2♂, same data as holotype. Material in BMNH.

COMMENTS. *Ooencyrtus belus* is close to *hymen* (see comments under *hymen*).

Ooencyrtus bacchus sp.n.

(Figs 166–168)

DIAGNOSIS. Female: generally blackish, dark metallic green on head, greenish and brassy on mesoscutum and bluish on scutellum; a thin, faint purplish u-shaped line connects the toruli ventrally; legs, including coxae yellow; scape, pedicel and clava yellow, flagellum brown; gaster blackish with a slight green and brassy sheen; ovipositor sheaths yellow; mandibles with one tooth and a broad inner, minutely denticulate truncation; frontovertex about one-fourth head width; funicle segments at most quadrate, slightly wider distally, F5–6 conspicuously transverse; clava distinctly broader than funicle segments, without an enlarged apical sensory area; clypeus very slightly convex medially; scutellum with similar sculpture to mesoscutum in anterior one-third, posterior two-thirds smooth and shiny; forewing (Fig. 168) without a distinct naked basal area; linea calva open posteriorly; gaster shorter than thorax; ovipositor not exserted.

FEMALE. Length 0.70–0.75 mm (holotype 0.75 mm).

Head metallic green, coppery purple in ocellar area and brassy on genae; lower margins of toruli connected by a very thin, inconspicuous metallic purplish line across the lower part of the interantennal prominence; antennae with radicle black, scape and pedicel orange, funicle dark brown and clava yellow; pronotum, dark purple-brown; mesoscutum weakly metallic green, bordered purplish, axillae black with weak green tinge; scutellum anteriorly blackish and in posterior two-thirds metallic blue; mesopleuron and propodeum dark brown; all legs, including coxae, yellow; wings hyaline, venation testaceous; gaster dark purple-brown with slight green, purple or brassy sheen; ovipositor sheaths yellow.

Head with shallow, regular, polygonally reticulate sculpture on frontovertex; sculpture on lower face and genae shallower and longitudinally elongate; ocelli forming an equilateral triangle; posterior ocelli separated from occipital margin by about twice their own lengths and nearly touching eye margins; frontovertex about one-quarter head width; eyes not conspicuously hairy; occipital margin slightly rounded; antennae inserted just below ventral eye margins; toruli separated from mouth margin by about their own lengths; clypeus slightly convex medially; mandibles with a sharp outer tooth and a broad inner truncation bearing some mini-teeth on inner half; antennae (Fig. 167) with pedicel plus flagellum about as long as head width; scape at least 4 times as long as broad; funicle segments quadrate or transverse; clava distinctly broader than F6, as long as F3–6 together, with sensory area small and at apex only. Relative measurements (holotype): head width 36, head height 31, minimum frontovertex width 9, POL 4, OPL 3.5, OOL 0.3, eye length 22, eye width 17, scape length 15, scape width 3.5, malar space 13; other proportions of antennae as in Fig. 167.

Mesoscutum with shallow imbricate-reticulate sculpture; scutellum with polygonally reticulate sculpture anteriorly, not deeper than mesoscutum, gradually becoming shallower posteriorly, posterior two-thirds smooth, apex rounded; forewing with venation and distribution of setae basally as in Fig. 168, without a distinct naked basal area; linea calva open posteriorly. Relative measurements (paratype): forewing length 84, forewing width 35; hindwing length 59; hindwing width 12.

Gaster shorter than thorax, last tergite somewhat emarginate posteriorly; ovipositor (similar to Fig. 335) hidden; hypopygium as in Fig. 166. Relative measurements (paratype): ovipositor length 76, gonostylus 13 [mid tibia 79].

MALE. Unknown.

VARIATION. Very little in material available.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype

♀, INDONESIA: Rakata Kecil, Krakatau Cent. Expdn, 20.ix.1984 (S.G. Compton). Paratypes, 3♀ (one on slide), same data as holotype. Holotype in BMNH, paratypes in BMNH and MZB.

COMMENTS. *Ooencyrtus bacchus* probably belongs to the same group of species as *ceres*, *iris* and *elissa*, all four species having the clypeus slightly convex medially, a very thin inconspicuous purple line connecting the lower margins of the toruli and very similar mandibular structure with the truncate part minutely denticulate. Of these species it is most similar to *elissa* in general habitus and coloration but can be separated from this species by the relatively shorter funicle segments and completely yellow legs. *O. elissa* has F3–6 conspicuously longer than broad and the hind coxae dark brown and the hind femur with a dark brown dorsal stripe. *O. bacchus* may also be close to *pacificus*, both species having all coxae yellow, clava distinctly paler than the funicle, clypeal margin medially produced, mandibles with a minutely denticulate truncation, posterior two-thirds of the scutellum smooth; forewing without conspicuous naked basal area and linea calva open posteriorly. In addition to the characters given in the key *O. bacchus* can be separated from *pacificus* by having the hind femora completely yellow, the clava distinctly broader than F6 and at least as long as F4–6 together, and different structure of the hypopygium (compare Figs 166 and 171). In *pacificus* the hind femora are apically infuscate and the clava hardly broader than F6 and not as long as F3–6 together.

Ooencyrtus pacificus Waterston

(Figs 169–174)

Ooencyrtus pacificus Waterston, 1915: 307–310. LECTOTYPE ♀, (here designated) Fiji (BMNH, examined).

DIAGNOSIS. Female: length about 0.8–0.9 mm; body generally dark brown or blackish, head metallic green, genae somewhat brassy, interantennal prominence purple; mesoscutum metallic blue-green, posterior two-thirds of scutellum metallic green; antennae (Fig. 169) blackish with clava and tip of F6 contrasting pale yellow; legs completely yellow but with hind-femora a little infuscate apically; forewing almost hyaline but with an inconspicuous transverse infuscate band from apex of venation (Fig. 170); mandible (Fig. 173) with one tooth and a broad, minutely denticulate truncation; scape about 3 times as long as broad, pedicel slightly longer than F1–2 together; F1–3 smaller than F4–6; frontovertex about one-quarter head width; scutellum anteriorly with shallower sculpture than mesoscutum, posterior two-thirds or so smooth and shiny; forewing (Fig. 170) without a conspicuous naked basal; linea calva open; postmarginal vein about one-third as long as stigmal; ovipositor (Fig. 171) not exserted; hypopygium similar to Fig. 36. Male: length 0.6–0.8 mm; generally similar to female but flagellum unicolorous testaceous-brown; hind-femora dark brown; all funicle segments at least twice as long as broad and clothed in setae 2–3 times as long as diameter of segments (Fig. 174); aedeagus about 0.6 times as long as mid tibia.

HOSTS. Reared from eggs of the bean bug (*Brachyplatys pacificus*) (Waterston, 1915), and recorded below from an unidentified pest of pigeon pea.

DISTRIBUTION. Fiji.

MATERIAL EXAMINED. Type material. Lectotype ♀, FIJI: Rarawai, Viti Levu, bred from eggs of the Bean Bug (*Brachyplatys pacificus* Dall.) (R. Veitch), B.M. TYPE HYM. 5. 1,076. Paralectotypes, 1♀, 1♂, same data as lectotype, but no type number (BMNH).

Other material. FIJI: 8♀, 3♂, Viti Levu, ex pests of pigeon pea, Lab. bred, IIE 22057, 26.ix.1991. Material in BMNH.

COMMENTS. A very detailed description of this species is provided by Waterston (1915). See also comments under *Ooencyrtus bacchus* above.

Ooencyrtus larvarum (Girault)

(Figs 175–180)

Paracopidosomopsis larvarum Girault, 1919b: 58. LECTOTYPE ♀ (here designated), Indonesia (QMB, examined).

Ooencyrtus larvarum (Girault); Noyes & Hayat, 1984: 309.

DIAGNOSIS. Female (length 0.71 mm–0.80 mm): body generally dark brown or blackish; head, mesoscutum and basal two-thirds of scutellum with a dull metallic green lustre; apical third of scutellum smooth and bright metallic green; scape and pedicel yellowish, flagellum testaceous-yellow or brownish; tegulae basally yellow; legs, including coxae, yellow; gaster dark brown; antennae (Fig. 175) with F1 transverse and much smaller than F2–6 which are all transverse; clava about as long as F4–6 together and with a very slight oblique apical truncation and sensory enlarged somewhat enlarged; mandibles

(Fig. 176) with two long sharp teeth and a small, inner third tooth; frontovertex about one-third head width; gena, about two-thirds eye length, mouth opening less than two-fifths head width with clypeus medially distinctly convex (Fig. 178); ovipositor (Fig. 179) with basal part of second valvifer characteristically broadly curved, but short, gonostylus one-quarter ovipositor length; hypopygium (Fig. 177) short. Male (0.63–0.71 mm): very similar to female but for antennae and genitalia. Antennae (Fig. 180) with clava yellowish and slightly paler than rest of flagellum; all funicle segments subquadrate, but F1 clearly smaller than other segments which are subequal; flagellum clothed in setae which are not longer than diameter of segments; aedeagus about two-thirds as long as mid tibia.

HOSTS. The type series was reared from larva of *Delias* sp. (Girault, 1919b), but material recorded below was reared from eggs of *Eurema* sp. (both Lepidoptera: Pieridae).

DISTRIBUTION. Thailand, Indonesia.

MATERIAL EXAMINED. Type material. Lectotype ♀, 'Paracopidosomopsis larvarum Gir. ♀ Types' in Girault's handwriting, QUEENSLAND MUSEUM [green label], no other data but according to Girault (1919b) the material was reared from a larva of *Delias* sp. from Salatiga, Java in INDONESIA. Paralectotypes, 2♀, 7♀, same data as lectotype, but mounted separately (1♀, 2♂ remounted on slides). Material in QMB.

Non-type material. THAILAND: 2♀, 2♂, Chedi Mae Khrua, ex eggs of *Eurema* sp., 26.i/5.ii.1990 (R. Harberd). Material in BMNH.

COMMENTS. Girault (1919b) mentions only males, but mounted on the same card as the male syntypes are three females and therefore we have no hesitation in selecting the best of these as lectotype. Superficially males and females of this species are very similar, especially if poorly mounted as are the syntypes.

This species has very characteristic mandibles (see Fig. 176) and antennae (Fig. 175) and both sexes should prove to be easy to separate from other species of the genus on these characters alone. The head shape is also very characteristic being similar to species of *Arrhenophagus* with elongate genae which taper inwards towards a relatively narrow mouth and a distinctly convex clypeal margin.

Ooencyrtus pallidipes (Ashmead)

(Figs 181–186)

Aphidencyrtus pallidipes Ashmead, 1904a: 15. LECTOTYPE ♀ (here designated), Philippines (USNM, examined).

Ooencyrtus erionotae Ferrière, 1931: 284. LECTOTYPE ♀ (here designated), Malaysia (BMNH, examined). **Syn. n.**

Ooencyrtus pallidipes (Ashmead); Noyes & Hayat, 1984: 309.

DIAGNOSIS. Body generally dark brown or blackish; head largely metallic green, purplish in ocellar area and on interantennal prominence; mesoscutum dull bluish green; scutellum dull green anteriorly with slightly coppery tinge, shining metallic green in posterior one-quarter or so; flagellum testaceous-yellow; all legs, including coxae, yellow; mandibles with one tooth and a broad truncation; scutellum anteriorly with punctate-reticulate sculpture and with posterior one-quarter smooth (similar to Fig. 316); forewing (Figs 182, 184) with large naked basal area; basal cell with a small patch of ventral setae posteriorly; linea calva open; postmarginal vein from one-third to two-thirds length of stigmal. Female (length 0.82–1.25 mm): gaster blackish but sometimes with small whitish marks laterally near petiole dorsally; ovipositor sheaths yellow; antennae (Fig. 181) filiform, F1–5 distinctly longer than broad; F6 slightly transverse to slightly longer than broad; frontovertex at most 1/5 head width (Fig. 183); ovipositor very slightly exserted and similar to Fig. 122, 1.2 times as long as mid-tibia, gonostylus about one-sixth ovipositor length; hypopygium as in Figs 185, 186. Male (length 0.75–0.95 mm): as female but antennae whitish or pale yellow, F1 smaller than F2–6 but all funicle segments longer than broad and clothed in setae a little longer than diameter of segments; frontovertex nearly one-third head width.

HOSTS. A parasitoid of the eggs of *Erionota thrax* (Lepidoptera: Hesperiidae), but also recorded from the eggs of *Caligo memnon* (Lepidoptera: Nymphalidae) a Neotropical species being reared in Thailand for commercial purposes (see below). The original record from an undetermined aphid host (Ashmead, 1904a) is undoubtedly erroneous. The record of this species, as *O erionotae*, from the eggs of *Agrilus sexsignatus* (Coleoptera: Buprestidae) (Braza, 1988, 1989) is a misidentification of *Orianos brazai* Noyes (see Noyes, 1990).

USE IN BIOCONTROL. The species was succesfully introduced into Mauritius in 1971–1972 (Waterhouse & Norris, 1989) and Hawaii in 1973 (Mau *et al.*, 1980) for the control of *Erionota thrax* (Lepidoptera: Hesperiidae).

DISTRIBUTION. Mauritius (introduced), Nepal, Thailand, P. R. China, Philippines, Malaysia, Indonesia, Papua N. Guinea, Guam, Hawaii (introduced).

MATERIAL EXAMINED. Type material. *Aphidencyrtus pallidipes* Ashmead: Lectotype ♀, PHILIPPINES: 'Manila PI, W.A. Stanton Collector, Aphidencyrtus pallidipes Ash. ♂♀' in Ashmead's handwriting, '♀ Type No.7701 U.S.N.M.' (USNM). Paralectotype, 1♀, same data as lectotype (BMNH). *Ooencyrtus erionotae* Ferrière: Lectotype ♀, MALAYSIA: 'Type, Malaya, Sungei Tua, 31.vii.28, ex. ova of *Erionota thrax*, G.H. Corbett, Pres. by Imp. Inst. Ent. Brit. Mus. 1931–367, *Ooencyrtus erionotae* sp.n. ♀ type, Ch. Ferriere det., B.M.TYPE HYM. 5. 1,071' (BMNH). Paralectotypes, MALAYSIA: 1♀, 3♀, same data as lectotype but with 'cotype' label; 19♀, 3♂, Kuala Lumpur, 13.i.1921, Ulu Gombak, ex. ova of indet. on wild plantain leaf, 27.i.1921 (Dr, W.A. Lamborn) 'Ooencyrtus erionotae, sp.n. Ch. Ferriere det.' (BMNH).

Non-type material. NEPAL: 3♀, 1♂, Rampur, ex. eggs of banana skipper, 2.vi.1981; THAILAND: 7♀, 1♂, Chedi Mae Khrua , ex eggs of *Caligo memnon* (N.), 23.i/11.ii.1990 (Ray Harberd); 3♀, Chedi Mae Khrua, ex eggs of unknown species, ?.1990 (Ray Harberd); P. R. CHINA: 10♀, 2♂, Fujian, Fuzhou, ex. eggs of *Erionota thrax* on banana, 5.vii.1986; 25♀, 3♂, Hainan, Xinglong, ex. eggs of butterfly, 5.iv.1964 (D.-x. Liao); INDONESIA: 1♀, East Sumatra, Asahab 50–60m., from gambir pests, 1934–1936 (F. Schneider); 1♀, Java, Siloewok, Sawangan Est., ex eggs of *Hadart thrax*, 18.viii.1938 (Ir Duyvendijk); PAPUA NEW GUINEA: 3♀, 1♂, Morobe Prov., Markham Velley, Kaiapit, ex eggs *Erionota thrax* on banana, 15.v.1987 (P. Merrett); 13♀, 1♂, Lae, ex *Erionota thrax*, 13.vi.1987 (P. Merrett); 3♀, Lae, ex eggs of *Erionota thrax*, 8.viii.88; 5♀, West Highland Province, Mt. Hagen, ex. eggs of banana skipper, CIE A20946, 27.vi.1989 (T. Solulu); 16♀, 1♂, Morobe Prov., ex. eggs of *Erionota thrax*, CIE A19626, 15.v.1987 (P. J. Merrett). In BMNH.

COMMENTS. *Ooencyrtus pallidipes* is generally similar to *pilosus* (see comments under *pilosus* below).

Ooencyrtus pilosus sp.n.

(Figs 187–189)

DIAGNOSIS. Female: body generally dark brown or blackish; head metallic green with a coppery purple sheen; mesoscutum with a weak blue-green lustre; scutellum green; antennae yellowish; legs, including coxae, yellow; ovipositor sheaths dark brown; antennae (Fig. 187) with flagellum filiform; pedicel broader than F1 and as long as F1–2 combined; all funicle segments longer than broad, F1–2 smaller and more slender than F3–6; clava slender and apically rounded; frontovertex about one-quarter to one-sixth head width; ocelli forming an acute angle; mandibles with one tooth and a broad, minutely denticulate truncation; forewing (Fig. 189) with marginal vein distinctly longer than broad, basal cell densely hairy without a conspicuous naked area basally, linea calva closed posteriorly; scutellum slightly convex, with posterior one-fifth or so smooth and shiny, anteriorly with punctate-reticulate sculpture; ovipositor slightly exserted, gonostylus black.

FEMALE. Length: 0.85–1.1 mm (holotype 1.1 mm).

Head blackish, with frontovertex shining green, with a distinctly coppery purple sheen in ocellar area, interantennal prominence purplish; antennae yellowish, but scape and pedicel brown proximally on dorsal surface; pronotum blackish; mesoscutum and axillae similar but with weak blue-green sheen; scutellum shiny green or blue-green, basally slightly coppery; mesopleuron and propodeum dark purple-brown; legs, including coxae, totally yellow; wings hyaline, venation testaceous-yellow; gaster dark brown with a metallic green sheen, basal tergite stronger green-blue; ovipositor sheaths dark brown.

Head with very fine shallow, polygonally reticulate sculpture on frontovertex; sculpture on genae longitudinally elongate; ocelli forming a strongly to hardly acute angle; posterior ocelli separated from occipital margin by about twice their own lengths and nearly touching eye margins; eyes not conspicuously hairy; occipital margin more or less rounded; frontovertex about one-quarter to one-sixth head width; antennae inserted well below ventral eye margins; antennae (Fig. 187) with pedicel plus flagellum as long as head width or slightly shorter; clava with sensory area slightly enlarged but limited to apex only; mandibles with one outer tooth and one inner broad, minutely denticulate truncation (Fig. 188). Relative measurements (holotype): head width 40, head height 37, minimum fron-

tovertex width 8, POL 3.5, OOL 0.3, eye length 25, eye width 24, malar space 15, scape length 15, width 2.7; other proportions of antenna as in Fig. 187.

Mesoscutum with shallow imbricate-reticulate sculpture; scutellum with much deeper, regular, punctiform-reticulate sculpture in anterior four-fifths or less, posterior one-fifth to one-third smooth and shiny; mesopleuron with shallow elongate reticulations; forewing with venation and setation at base as in Fig. 189, with only a very small naked basal area and basal cell with only a few ventral setae posteriorly; linea calva closed. Relative measurements (holotype): forewing length 90, forewing width 38; hindwing length 56; hindwing width 15.

Gaster a little shorter than head plus thorax; ovipositor hidden or very slightly exserted; ovipositor structure similar to Fig. 189; hypopygium similar to 25. Relative measurements (paratype): ovipositor length 46, gonostylus 8.5 [mid tibia 40.5].

MALE. Unknown.

VARIATION. As noted above there is variation in the relative width of the frontovertex and corresponding angle formed by the ocelli and also in the width of the smooth part of the scutellum.

HOSTS. Unknown.

DISTRIBUTION. Malaysia, Indonesia.

MATERIAL EXAMINED. Holotype ♀, INDONESIA: Sulawesi, Utara, Dumoga-Bone NP, Toraut, 10.iii.1985, NH Canopy Fog #11. Paratypes, MALAYSIA: 1♀, Sabah, Mt. Kinabalu NP, Poring Hot Spring, 900m, BM 1987–349, 14.v.1987 (A. Smetana); INDONESIA: 1♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut 450m, 11.ii.1985, BMNH Canopy Fog #5; 3♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, 200m, 11.vii.1985, NH Canopy Fog #13. Holotype and paratypes in BMNH, paratype in MZB.

COMMENTS. The mandibular structure suggests that *O. pilosus* is close to the same group of species as *elissa* and *ceres* (see comments under *elissa* above). Apart from the characters given in the key *pilosus* can be separated from these species by having the interantennal prominence purplish and lacking the narrow purple line joining the ventral margins of the toruli. The other named species all have the interantennal prominence green and with a thin, faint purple line connecting the lower margins of the toruli.

Females of *O. pilosus* are similar in general appearance to *pallidipes*, both species having the legs totally yellow, the gaster completely dark brown, or very nearly so, and the flagellum filiform, the scutellum anteriorly punctate-reticulate and posteriorly smooth and shiny. In addition to the characters given in the key *pilosus* can be separated from *pallidipes* by having F6 clearly longer than broad, the forewing with only a very small, inconspicuous naked basal area with only a few ventral setae posteriorly and the linea calva closed. *O. pallidipes* has F6 more or less quadrate, the forewing with a conspicuous naked basal area with a distinct patch of ventral setae posteriorly and the linea calva open.

Ooencyrtus valcanus sp.n.

(Figs 190–192)

DIAGNOSIS. Female: body generally dark brown or blackish; head weakly metallic; mesoscutum faintly metallic blue; scutellum matt; all legs, including coxae, yellow; ovipositor sheaths dark brown; mandible more or less tridentate; frontovertex about one-third head width; ocelli forming a slightly acute angle; posterior ocelli separated from eyes by their own lengths; antennae (Fig. 190) with pedicel plus flagellum about 1.2 times as long as head width; flagellum filiform; funicle segments at least subquadrate or slightly longer than broad; clava with oblique apical truncation, as long as F3–6 together, the sensory part enlarged and occupying the whole of the ventral side of the apical segment; scutellum nearly flat, with regular raised reticulate sculpture and only vertical margins smooth; forewing (Fig. 192) without a naked basal area; linea calva open; postmarginal vein very short and about one-fourth stigmal vein; ovipositor not exserted.

FEMALE. Length 1 mm (holotype).

Head blackish, frontovertex dull metallic green with a faint purple sheen, face and genae slightly more shiny, interantennal prominence slightly purple-blue; antennae except radicle yellow-testaceous; pronotum and axillae blackish with weak a sheen; mesoscutum weakly metallic blue-green; scutellum mainly matt black, posterior margin slightly metallic green, vertical margins smooth and more strongly metallic green; mesopleuron and propodeum brown; legs, including coxae, yellow; wings hyaline, venation testaceous-yellow; gaster dark brown; ovipositor sheaths dark brown.

Head with fairly regular, polygonally reticulate sculpture on frontovertex; lower parts of face and genae with elongate sculpture; ocelli small, forming a slightly acute angle; posterior ocelli

separated from occipital margin by 1.5 times their own lengths and from eye margins by about their own lengths; eyes not conspicuously hairy; occipital margin not rounded; frontovertex about one-third head width; antennae inserted far bellow the ventral eye margin; toruli separated from mouth margin by less than their own lengths; antennae (Fig. 190) with pedicel plus flagellum about 1.2 times as long as head width; clava about as long as F3–6 together, with sutures strongly oblique and an elongate, oblique apical truncation with an enlarged sensory area occupying the whole of the truncate area; mandibles more or less tridentate. Relative measurements (holotype): head width 34, head height 30, minimum frontovertex width 12, OPL 3, POL 5, OOL 2, eye length 19, eye width 15, malar space 14, scape length 18, scape width 3; other proportions of antenna as in Fig. 190.

Mesoscutum with shallow imbricate-reticulate sculpture; scutellum with deeper, regular reticulate sculpture and with only vertical margins smooth; forewing with venation and distribution of setae at base as in Fig. 192, without conspicuous naked basal area and with only a few setae posteriorly on ventral surface of basal cell; linea calva open. Relative measurements (paratype): forewing length 98, forewing width 41; hindwing length 61, hindwing width 14.

Gaster as long as thorax; ovipositor hidden, gonostyli about one-fifth length of ovipositor; hypopygium as in Fig. 191. Relative measurements (paratype): ovipositor length 40, gonostylus 8 [mid tibia 34].

MALE. Unknown.

VARIATION. Very little in material available.

HOSTS. Unknown.

DISTRIBUTION. Nepal.

MATERIAL EXAMINED. Type material. Holotype ♀, NEPAL: Bardia, 10–24.iii.1983 (M.G. Allen). Paratype, 1♀, same data as holotype. Material in BMNH.

COMMENTS. *O. valcanus* is very probably most closely related to *mimus* Prinsloo and *distatus* Prinsloo, known from the Afrotropical region. All three species can be characterised by the obliquely truncate clava and the relatively flat, uniformly sculptured, matt scutellum. *O. valcanus* can be separated from these species by the completely yellow legs, relatively longer funicle segments and from *distatus* additionally by the more or less tridentate mandibles. Both *mimus* and *distatus* have the legs largely dark brown and most funicle segments distinctly transverse, whilst *distatus* has the mandibles each with two teeth and a clear truncation.

Ooencyrtus urania sp.n.

(Figs 193–195)

DIAGNOSIS. Female: body generally dark brown or blackish; head with scrobal area quite strongly metallic green, interantennal prominence purplish; mesoscutum with a silky appearance and clothed in conspicuous silvery setae; scutellum metallic blue-green; all legs, including coxae, yellow; both femora and tibia with a subapical brown mark adjacent to knees; gaster dark brown; ovipositor sheaths yellow; frontovertex about one-quarter head width; eyes conspicuously hairy; antennae (Fig. 193) with pedicel plus flagellum as long as head width; flagellum strongly clavate; clava slightly longer than F3–6 together with sutures oblique and an oblique apical truncation, the sensory part occupying whole of ventral side of apical segment; mandible with one tooth and a broad, minutely denticulate truncation; scutellum slightly convex, with relatively deep sculpture anteriorly, posteriorly slightly shallower and only vertical margins smooth and shiny; forewing (Fig. 195) with only a very small naked basal area; linea calva closed; ovipositor not exserted.

FEMALE. Length 0.95 mm (holotype).

Head blackish, mostly metallic green, but ocellar area coppery purple and interantennal prominence purple; antennae with radicle black, proximal one-third of scape yellow and distal two-thirds testaceous, pedicel and flagellum testaceous; pronotum and axillae black with a purple sheen; mesoscutum blackish with a weak green sheen and clothed in conspicuous silvery setae; anterior two-thirds of scutellum blue-green, posterior one-third similar but with a purplish sheen, vertical margins smooth and shiny, green; mesopleuron and propodeum dark brown; legs, including coxae, yellow; femora and tibiae near knees with a small brown mark; wings hyaline, venation testaceous-yellow; gaster dark brown with a metallic green sheen; ovipositor sheaths yellow.

Frontovertex with fine, regular, polygonally reticulate sculpture which may be extremely shallow between anterior ocellus and top of scrobes; lower face and genae with longitudinally elongate sculpture; ocelli forming an equilateral triangle; posterior ocelli separated from occipital margin by about 1.5 times their own lengths and nearly touching eye margins; eyes conspicuously

hairy; occipital margin slightly rounded; frontovertex about one-quarter to one-fifth head width; head, in facial view, about 1.3 times as broad as high; antennae inserted just below ventral eye margins; toruli separated from mouth margin by their own lengths; antennae (Fig. 193) with pedicel plus flagellum about as long as head width; flagellum conspicuously clavate; clava slightly longer than F3–6 segments together, the sutures oblique and apex obliquely truncate with sensory area occupying whole of truncate part; mandible with one tooth and broad truncation. Relative measurements (holotype): head width 44, head height 34, minimum frontovertex width 10, OPL 4, POL 3, OOL 0.5, eye length 25, eye width 24, malar space 14, scape length 18, scape width 4; other proportions of antenna as in Fig. 193.

Mesoscutum with moderately deep, very fine imbricate-reticulate sculpture of silky appearance; scutellum moderately convex, with regular punctiform-reticulate sculpture in anterior two-thirds which is conspicuously deeper than sculpture of mesoscutum, posterior one-third with slightly shallower transversely reticulate sculpture, vertical part of sides and apex smooth and mirror shiny; forewing with venation and distribution of setae at base as in Fig. 195, without a naked basal area, basal cell with a few ventral setae posteriorly; linea calva closed. Relative measurements (paratype): forewing length 90, forewing width 41; hindwing length 62, hindwing width 14.

Gaster distinctly shorter than thorax, almost rounded in dorsal view, last tergite apically truncate; ovipositor similar to Fig. 122 and not exserted; hypopygium as in 194. Relative lengths (paratype): ovipositor 25.5, gonostylus 5.5 [mid tibia 26].

MALE. Unknown.

VARIATION. There is slight variation in the relative width of the frontovertex as outlined above.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Krakatau, Anak, 10.ix.1984 (S. Compton). Paratypes, INDONESIA: 1♀, Krakatau, Anak, 13.ix.1984 (S. Compton); 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, Agricultural sample, BMNH Canopy Fog. #9, ii.1985. Holotype in MZB, paratypes in BMNH.

COMMENTS. Females of *O. urania* can be separated from females of other species of the genus with yellow legs, dark gaster and obliquely truncate clava by the conspicuously hairy eyes, mesoscutum with conspicuous silvery setae, punctate-reticulate scutellum and yellow ovipositor sheaths.

Ooencyrtus vertumnus sp.n.

(Figs 196–200)

DIAGNOSIS. Female: body generally dark brown; head metallic green, purplish in ocellar area; mesoscutum and scutellum with a metallic green or blue-green sheen; all legs, including coxae, yellow; gaster dark brown; ovipositor sheaths dark brown; frontovertex about one-quarter head width; ocelli forming a distinctly acute angle; posterior ocelli nearly touching eyes; antennae (Fig. 196) with pedicel plus flagellum as long as head width; flagellum clavate; funicle segments not longer than broad or hardly so; clava nearly as long as F3–6 together, with outer suture slightly oblique and apex obliquely truncate, the sensory area enlarged and occupying the whole of the truncate part of the clava but less than one-third as long as clava; mandible more or less tridentate; scutellum convex, with regular raised punctate-reticulate sculpture but with veritical sides and apex smooth; forewing (Fig. 198) with only a small naked basal area, basal cell with a conspicuous narrow patch of ventral setae; linea calva nearly closed; postmarginal vein about as long as stigmal vein; ovipositor clearly exserted, the exserted part about as long as a mid tibial spur.

FEMALE. Length excluding ovipositor 1.05–1.22 mm (holotype 1.17 mm).

Ocellar area blackish with a slight purple sheen, scrobal area metallic green, genae with a slightly brassy sheen; interantennal prominence duller but with a metallic purple and blue line connecting the toruli; antennae with radicle black, scape yellow, pedicel and flagellum yellow-testaceous; pronotum, and axillae blackish with a purple tinge; scutellum blue-green but anterior one-quarter coppery-purple, sides and apex shining metallic green; mesopleuron and propodeum dark brown; legs, including coxae, yellow; wings hyaline, venation testaceous-yellow; gaster dark brown with a slight metallic green sheen; ovipositor sheaths dark brown.

Frontovertex with regular, polygonally reticulate sculpture, in ocellar area moderately deep but shallow between anterior ocellus and top of scrobes; genae with longitudinally reticulate sculpture; ocelli relative large, forming equilateral or slightly more acute triangle; posterior

ocelli separated from occipital margin by their own lengths or slightly less and nearly touching eye margins; eyes not conspicuously hairy; occipital margin rounded; frontovertex about one-quarter head width (Fig. 197); antennae inserted about far below the ventral eye margins, toruli about half their own lengths below eye margins; toruli separated from mouth margin by less than their own lengths; antennae (Fig. 196) with pedicel plus flagellum about as long as head width; pedicel as long as following two segments together; flagellum conspicuously clavate; clava distinctly broader than F6, and nearly as long as F3–6 together, the sutures parallel, but apex obliquely truncate, with sensory area enlarged and occupying the whole truncate area, about one-third as long as clava; mandible more or less tridentate in appearance. Relative measurements (holotype): head width 39, head height 38, minimum frontovertex width 9, OPL 3, POL 3, OOL 0.5, eye length 26, eye width 21, malar space 16, scape length 17, scape width 3.5; other proportions of antenna as in Fig. 196.

Mesoscutum with shallow, imbricate-reticulate sculpture; scutellum with conspicuously deeper punctate-reticulate sculpture, slightly shallower towards apex but with only the vertical sides and apex smooth and shiny; forewing with venation and distribution of setae at base as in Fig. 198, with only a small naked basal area, basal cell with a few ventral setae posteriorly; linea calva nearly closed. Relative measurements (paratype): forewing length 111, forewing width 44; hindwing length 74, hindwing width 16.

Gaster a little longer than thorax; ovipositor (Fig. 199) exserted; hypopygium as in Fig. 200. Relative lengths (paratype): ovipositor 55, gonostylus 14 [mid tibia 27].

MALE. Unknown.

VARIATION. Very little variation is present in the material at hand, but in some specimens the metallic purple and blue line connecting the antennal toruli is inconspicuous. In the antennae F2–F5 may be either slightly transverse or quadrate.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut 200m, BMNH Canopy Fog #13, 11.vii.1985. Paratypes, INDONESIA: 3♀, Sulawesi Utara, Dumoga-Bone NP, same data as holotype; 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 300m, 13.ii.1985, BMNH Canopy Fog #3; 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 8.ii.1985, BMNH Canopy Fog #3; 9♀, Sulawesi Utara, Toraut, agricultural sample, ii.1985, BMNH Canopy Fog #9; 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 10.iii.1985, BMNH Canopy Fog #11. Holotype in BMNH, paratypes in BMNH, MZB.

COMMENTS. *Ooencyrtus vertumnus* probably belongs to the same group of species as *libitina* and is probably closest to that species (see comments under *libitina*). Superficially, *vertumnus* is also similar to *vesta* but differs in having the pedicel plus flagellum as long as the head width, F1–5 longer than broad or subquadrate, clava with sensory area about one-third as long as clava and scutellum with punctate-reticulate sculpture. In *vesta* the pedicel together with the flagellum is not more than about 0.9 times as long as head width, F1–5 are strongly transverse, the sensory are of the clava is about half its length, and the scutellum has relatively shallow punctate sculpture anteriorly which is only slightly deeper than sculpture on meoscutum.

Ooencyrtus vesta sp.n.

(Figs 201, 202)

DIAGNOSIS. Female: body generally dark brown; head purplish on frontovertex, metallic green in scrobal area; mesoscutum with a weak metallic blue-green sheen; scutellum blue-green, basal third or so purplish; all legs, including coxae, yellow; gaster dark brown; ovipositor sheaths dark brown; frontovertex about one-fifth head width; antennae (Fig. 202) with pedicel plus flagellum distinctly shorter than head width; flagellum strongly clavate, all funicle segments transverse, clava with an oblique apical truncation, as long as F2–6 together, sutures between segments hardly oblique, the sensory part enlarged and about half as long as clava; mandible with three teeth; scutellum with sculpture in anterior half polygonally reticulate and only slightly deeper than sculpture on mesoscutum, posterior half with shallower sculpture, extreme sides and apex smooth and polished; forewing (similar to Fig. 198) with only a small naked basal area; linea calva closed; postmarginal vein long and about as long as stigmal vein; ovipositor (similar to Fig. 199) slightly exserted.

FEMALE. Length excluding ovipositor 1.1–1.2 mm (holotype 1.13 mm).

Frontovertex blackish with a purple sheen, scrobal area metallic green; interantennal prominence slightly purplish, genae a little brassy;

antennae with radicle black, scape yellow, pedicel and flagellum yellow-testaceous; pronotum and axillae dark purple-brown; mesoscutum with a weak blue-green sheen; scutellum metallic blue-green but coppery purple in anterior half or so, posterior half blue-green; mesopleuron and propodeum dark brown; legs, including coxae, yellow; wings hyaline, venation testaceous-yellow; gaster dark brown with a weak metallic blue-green sheen, especially on basal tergite; ovipositor sheaths dark brown.

Frontovertex with very shallow, regularly, polygonally reticulate sculpture, almost smooth between antennal scrobes and anterior ocellus; genae with longitudinally elongate sculpture; ocelli relative large, forming an angle of about 50°; posterior ocelli separated from occipital margin by about 1.5 times their own lengths and nearly touching eye margins (Fig. 201); eyes not conspicuously hairy; occipital margin slightly rounded; frontovertex about one-fifth head width or a little wider; antennae inserted about the length of a torulus below the ventral eye margins; toruli separated from mouth margin by about half their own lengths; antennae (Fig. 202) with pedicel plus flagellum about 0.8–0.9 times as long as head width; flagellum strongly clavate with all funicle segments transverse; clava with an oblique apical truncation, about as long as F2–6 together, the sutures hardly oblique, the sensory area enlarged and about half as long as the clava; mandible tridentate. Relative measurements (holotype): head width 38, head height 37, minimum frontovertex width 8, OPL 4, POL 3, OOL 0.3, eye length 26, eye width 23, malar space 15, scape length 17, scape width 3.5; other proportions of antenna as in Fig. 202.

Mesoscutum with shallow imbricate-reticulate sculpture; scutellum convex with regular polygonally reticulate sculpture in anterior half which is hardly deeper than sculpture on mesoscutum, posterior half with shallower, more irregular, elongate sculpture, the extreme apex and sides smooth and polished; forewing with venation and distribution of setae at base similar to Fig. 198, with only a small naked basal area, and with a few ventral setae posteriorly in basal cell; linea calva more or less closed; postmarginal about as long as stigmal vein. Relative measurements (paratype): forewing length 100, forewing width 42; hindwing length 68, hindwing width 15.

Gaster a little longer than thorax; ovipositor (similar to Fig. 199) slightly exserted; hypopygium similar to Fig. 200 but with the posterior margin smooth. Relative lengths (paratype): ovipositor 52, gonostylus 11 [mid tibia 24].

MALE. Unknown.

VARIATION. Very little in material available.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, 450m, BMNH Canopy Fog #5, 11.ii.1985. Paratypes, INDONESIA: 2♀, same data as holotype; 3♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, 11.vii.1985, BMNH Canopy Fog #13; 2♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 8.ii.1985, BMNH Canopy Fog #3; 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, Toraut, Agricultural sample, ii.1985, BMNH Canopy Fog #9. Holotype in BMNH, paratypes in BMNH and MZBI.

COMMENTS. *Ooencyrtus vesta* is similar to *maenas* but differs in the sculpture of the scutellum, colour of the gaster and relative length of the ovipositor. The present species has the anterior part of the scutellum with sculpture that is hardly deeper than that on the mesoscutum, the ovipositor slightly more than twice as long as the mid tibia and the gaster completely dark brown. In *maenas* the scutellum has conspicuously deeper sculpture than the mesoscutum, the ovipositor is only about 1.5 times as long as the mid tibia and the gaster is largely yellow or orange. *O. vesta* is also superficially similar to *Ooencyrtus vertumnus* (see comments under *vertumnus*, above).

Ooencyrtus boreas sp.n.

(Figs 203–207)

DIAGNOSIS. Female: head and dorsum of thorax bright blue-green; all legs, including coxae, yellow; tegulae yellow; gaster dark brown with a weak metallic green sheen; ovipositor sheaths yellow; ocelli forming a 45° angle; occipital margin sharp; antennae (Fig. 206) with pedicel plus flagellum as long as head width; flagellum filiform; clava as long as F4–6 together; mandible with one very small tooth and a broad truncation which is minutely denticulate on the inner half; eye conspicuously hairy; frontovertex about one-fifth head width; scutellum slightly convex, with fine punctate-reticulate sculpture which is shallower near apex and sides; forewing (Fig. 207) with a transverse cloudy band medially and with a conspicuous naked basal area; linea calva open; postmarginal vein only slightly shorter than stigmal vein; ovipositor very slightly exserted. Male: very similar to female but generally brighter metallic green; antenna with clava slightly paler

than funicle; funicle segments quadrate or very slightly longer than broad and clothed in setae which are not longer than diameter of segments; mesoscutum and scutellum with very similar, moderately deep, fine, reticulate sculpture; forewing hyaline.

FEMALE. Length 0.95–1.10 mm (holotype 1.07 mm).

Head metallic blue-green with a slight violet sheen in ocellar area and purplish on interantennal prominence dorsally; antennae yellow, but radicle black; dorsum of thorax blue-green; tegulae yellow; mesopleuron and propodeum dark brown; legs, including coxae, yellow; wings with a transverse cloudy band medially from apex of venation, venation brown except proximal half of submarginal vein testaceous-yellow; gaster dark brown with bluish or green sheen, ovipositor sheaths yellow.

Head with fairly conspicuous, almost punctate reticulate sculpture on frontovertex, face and genae; ocelli forming a 45° angle; posterior ocelli separated from occipital margin by about 1.5 times their own lengths and nearly touching eye margins; eye conspicuously hairy; occipital margin sharp; frontovertex about one-fifth head width; antennae inserted well below the lower eye margin; toruli separated from mouth margin by about their own lengths; antennae (Fig. 206) with pedicel plus flagellum about as long as head width; clava about as long as F4–6 together, with sensory area small and at extreme apex only; mandibles (Fig. 204) with one small tooth and a broad truncation which is minutely denticulate along its inner half. Relative measurements (holotype): head width 45, head height 40, minimum frontovertex width 9, OPL 6, POL 4, OOL 0.3, eye length 29, eye width 26, malar space 14, scape length 18, scape width 4; other proportions of antennae as in Fig. 206.

Mesoscutum with shallow, fine, imbricate-reticulate sculpture; scutellum mainly with deeper, almost punctate-reticulate sculpture, almost smooth near apex; forewing with venation and distribution of setae at base as in Fig. 207, with a distinct basal naked area, basal cell with only a few ventral setae posteriorly; linea calva open. Relative measurements (paratype): forewing length 116, forewing width 46; hindwing length 80, hindwing width 19.

Gaster at most as long as thorax; ovipositor (Fig. 205) very slightly exserted; hypopygium as in Fig. 203. Relative measurements (paratype): ovipositor length 54, gonostylus 9 [mid tibia 55].

MALE. Length 0.75 mm.

Apart from genitalia, differs from female only in characters given in diagnosis above.

HOSTS. Reared from eggs of *Stauropus lichenina* (Lepidoptera: Notodontidae).

DISTRIBUTION. Malaysia.

MATERIAL EXAMINED. Type material. Holotype ♀, MALAYSIA: Pahang, ex eggs of *Stauropus lichenina* Butl., 20.ii.1932 (G.H. Corbett). Paratypes, 9♀, 1♂, same data as holotype. Material in BMNH, IZAS.

COMMENTS. This species is characteristic and can be separated from others of the genus by the combination of the infuscate forewing, metallic blue-green head and thoracic dorsum, completely yellow tegulae and legs and dark brown gaster.

Ooencyrtus clio sp.n.

(Figs 208–211)

DIAGNOSIS. Female: body generally dark brown; head largely metallic green or purplish; mesoscutum with a very weak brassy sheen; scutellum matt black with a very slight green lustre; legs, including coxae, completely yellow, or nearly so; gaster dark brown; ovipositor sheaths yellowish; ocellar area distinctly elevated above rest of vertex (Fig. 210); posterior ocelli separated from occipital margin by 2.5 times their own lengths; antennae (Fig. 212) with pedicel plus flagellum a little longer than head width; flagellum filiform; clava not conspicuously broader than F6, a little longer than F4–6 together; mandible almost tridentate, with two teeth and a short truncation; scutellum almost entirely reticulate, with deeper sculpture than mesoscutum, only extreme vertical margin smooth and shiny; forewing (Fig. 209) hyaline with conspicuous naked basal area, linea calva open; ovipositor (similar to Fig. 266) slightly exserted.

FEMALE. Length excluding ovipositor 0.9 mm (holotype).

Head with raised ocellar area dark purplish, rest of vertex green, slightly coppery and brassy anterior to ocelli; scrobal area green, lower part of interantennal prominence purple, genae purplish; antennae with radicle dark brown, scape yellow, distal half brownish dorsally; pedicel with proximal half brown, distal half yellow; flagellum yellow, and clava perhaps slightly paler than funicle; pronotum, mesoscutum and axillae blackish with weak brassy tinge; scutellum almost matt black but with a slight blue-green

sheen, slightly mixed coppery near base; mesopleuron and propodeum dark brown; tegulae dark brown; legs, including coxae, yellow, but hind femur with a faint brown mark medially; wings hyaline, venation testaceous-yellow; gaster dark brown; ovipositor sheaths yellowish.

Head with ocellar area distinctly elevated above rest of vertex (Fig. 210) and with fine, regular reticulate sculpture, postocellar area with rough transverse reticulate sculpture, area anterior to ocelli very smooth an shiny; ocelli forming an equilateral triangle; posterior ocelli separated from occipital margin by 2.5 times their own lengths and almost touching eye margins; eye moderately hairy; frontovertex a little less than one-fifth head width; occipital margin hardly rounded; antennae inserted just below the ventral eye margin; toruli separated from mouth margin by about their own lengths; antennae (Fig. 208) with pedicel plus flagellum slightly longer than head width; clava slightly longer than F4–6 together, with sensory area small and at extreme apex only; mandibles (similar to Fig. 213) almost tridentate, with two distinct teeth and an emarginate inner truncation. Relative measurements (holotype): head width 33, head height 30, minimum frontovertex width 6, OPL 7, POL 3, OOL 0, eye length 23, eye width 21, malar space 10, scape length 15, scape width 2.5; other proportions of antenna as in Fig. 208.

Mesoscutum with moderately deep, transversely elongate, imbricate-reticulate sculpture; scutellum with deeper sculpture, anterior half medially with regular reticulate sculpture, towards the sides and apex conspicuously more elongate, but hardly shallower, only the posterior vertical margin smooth and shiny; forewing with venation and distribution of setae at base as in Fig. 209, with conspicuous naked basal area, basal cell with a narrow patch of ventral setae; linea calva open. Relative measurements (paratype): forewing length 79, forewing width 36; hindwing length 54, hindwing width 13.

Gaster longer than thorax; ovipositor similar to Fig. 266 and slightly exserted; hypopygium as in Fig. 211. Relative measurements (paratype): ovipositor length 38, gonostylus 8 [mid tibia 32].

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut 200m, BMNH Canopy Fog #13, 11.vii.1985. Paratype, 1♀, same data as holotype. Material in BMNH.

COMMENTS. *Ooencyrtus clio* is close to *circe* both species having the ocellar area slightly to very distinctly raised above the rest of the vertex. Apart from the characters given in the key the two species can be separated on slight differences in the relative proportions of the antennal segments, setation at the base of the forewing and structure of the hypopygium. In *clio* only F1–4 are longer than broad, and F6 is slightly transverse, the forewing has a conspicuous naked basal area, the linea calva is open and the hypopygium has only a shallow posterior median incision, whereas in *circe* F1–5 are longer than broad and F6 is quadrate, the forewing has no conspicuous basal naked area, the linea calva is closed and the hypopygium has a relatively deep posterior median incision.

Ooencyrtus circe sp.n.

(Figs 212–217)

DIAGNOSIS. Female: body generally dark brown; face metallic green, other parts of head purplish; mesoscutum slightly shiny, purple and blue; scutellum dark metallic green; antennae generally yellow with brown marks on scape and pedicel; wings hyaline; legs, including coxae, yellow; gaster dark brown; ovipositor sheaths dark brown; ocellar area indistinctly, but very slightly raised above level of frontovertex, this area with conspicuously rougher sculpture than rest of frontovertex; antennae (Fig. 212) as long as head width; flagellum filiform; all funicle segments much longer than broad; clava as long as F4–6 combined; mandible (Fig. 213) with a small outer tooth and a broad, slightly convex truncation; scutellum with relatively deep, punctate-reticulate sculpture, only the vertical sides and apex smooth; forewing (Fig. 214) without conspicuous naked basal area; linea calva closed; ovipositor very slightly exserted.

FEMALE. Length excluding ovipositor 0.85–1.05 mm (holotype 1.0 mm).

Head in ocellar area blackish dark coppery purple; scrobal area metallic green; interantennal prominence purplish; genae coppery; antennae with radicle black, scape yellow but distal half brown dorsally; pedicel proximal half brown, distal half yellow; flagellum yellow-testaceous and clava sometimes slightly paler than funicle; pronotum and axillae blackish with weak purple tinge; meoscutum relatively dull, blackish but with a slight purple or brassy sheen;

scutellum dark metallic blue-green; mesopleuron and propodeum dark brown; tegulae dark brown; legs, including coxae, yellow; wings hyaline, venation testaceous-yellow; gaster black-brown; ovipositor sheaths dark brown.

Head in ocellar area with fairly deep, polygonally reticulate sculpture which is slightly, but inconspicuously, raised above vertex; sculpture anterior to ocellar area similar but more shiny and almost smooth; lower parts of face and genae with elongate sculpture; ocelli forming an angle of about 50–60°; posterior ocelli separated from occipital margin by one and half times their own length and touching eye margins; eyes hairy but not conspicuously so; frontovertex a little less than one-fifth head width (Fig. 216); occipital margin slightly rounded; antennae inserted just below ventral eye margins; toruli separated from mouth margin by about their own lengths; antennae (Fig. 212) with pedicel plus flagellum about as long as head width; all funicle segments longer than broad, only slightly wider distally; clava apically rounded, as long as F4–6 together and with sensory part at extreme apex only; mandibles (Fig. 213) with one small tooth and a broad, slightly concave truncation. Relative measurements (holotype): head width 38, head height 32, minimum frontovertex width 7, OPL 3, POL 3, OOL 0, eye length 25, eye width 22, malar space 11, scape length 15, scape width 2.5; other proportions of antenna as in Fig. 212.

Mesoscutum with shallow imbricate-reticulate sculpture; scutellum with conspicuously deeper punctate-reticulate sculpture medially in anterior half, towards sides and apex similar, but more elongate, only extreme vertical sides and apex smooth and shiny; forewing with venation and distribution of setae at base as in Fig. 214, without conspicuous naked basal area, basal cell with only a few ventral setae; linea calva closed. Relative measurements (paratype): forewing length 84, forewing width 35; hindwing length 59, hindwing width 14.

Gaster longer than thorax; ovipositor similar to Fig. 266, and at least slightly exserted; hypopygium as in Fig. 217. Relative measurements (paratype): ovipositor length 40, gonostylus 8 [mid tibia 34].

MALE. Unknown.

VARIATION. Very little in type material, but see comments below.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, BMNH Canopy Fog #3, 8.ii.1985. Paratypes, INDONESIA: 4♀, same data as holotype; 2♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, BMNH Canopy Fog #11, 10.vii.1985; 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy Fog #13, 11.vii.1985. Holotype in BMNH, paratypes in BMNH and MZB.

Non-type material. INDONESIA: 1♀, BMNH Canopy Fog #15, 19.vii.1985; 1♀, 7 Sulawesi Utara, Dumoga-Bone NP, Toraut, 450m, BMNH Canopy Fog #5, 2.ii.1985. Material in BMNH

COMMENTS. The two specimens excluded from the paratype series differ from the type material in being slightly larger (1.2 mm), having the ocellar area markedly raised above the vertex (Fig. 215), the pedicel and flagellum together longer (about 1.15 times head width), the frontovertex a little more than one-fifth head width and the ovipositor about one-third longer than the mid tibia. These differences are generally very small and probably reflect a difference in overall body size.

Ooencyrtus circe is closest to *clio* (see comments under *clio* above).

Ooencyrtus clotho sp.n.

(Figs 218–220)

DIAGNOSIS. Female: generally dark brown or blackish, but head and dorsum of thorax distinctly metallic green or blue-green; antennae and all legs, including coxae, white-yellow; gaster dark brown; ovipositor sheaths dark brown; antennae with pedicel plus flagellum a little shorter than as head width; flagellum slightly clavate; funicle segments quadrate or transverse; head in facial view (Fig. 219) strongly transverse, about one-third broader than high; mandible almost appearing tridentate, with two teeth and a strongly emarginate truncation; mesoscutum and scutellum relatively flat; mesoscutum with dense translucent, brown setae; scutellum with fine, regular punctiform-reticulate sculpture; forewing without conspicuous naked basal area; linea calva closed; gaster sharply acute apically; ovipositor slightly exserted.

FEMALE. Length excluding ovipositor 1.0 mm (holotype).

Head in ocellar area metallic coppery purple, anterior to this metallic green; scrobal area metallic green, interantennal prominence purple, genae purplish with a green or blue sheen; anten-

nae with radicle pale brown, scape and pedicel whitish and flagellum pale yellow; pronotum and axillae dark purple-brown; mesoscutum metallic blue-green, slightly brassy posteriorly; scutellum metallic blue-green; mesopleuron and propodeum dark brown; tegulae dark brown; legs, including coxae, white-yellow; wings hyaline, venation testaceous-yellow; gaster dark purple-brown with a faint metallic blue tinge; gonostyli dark brown.

Head in facial view (Fig. 219) about 1.3 times as broad as high; frontovertex with fine, polygonally reticulate sculpture, deeper in ocellar area and anterior to this very shallow and almost smooth; lower parts of face and genae with elongate sculpture; ocelli forming an angle of about 50°; posterior ocelli separated from occipital margin by about their own lengths and clearly separated from eye margins; eyes hairy but not conspicuously so; frontovertex a little less than one-quarter head width; occipital margin hardly rounded; antennae inserted well below ventral eye margin; toruli separated from mouth margin by about their own lengths or slightly less; antennae (similar to Fig. 251) with pedicel plus flagellum about 0.9 times as long as head width; F1–4 quadrate, F5–6 transverse, distal segments slightly larger; clava as long as F3–6 together, apically rounded and with sensory area small and restricted to apex only; mandible with two teeth and a strongly emarginate truncation which gives it an almost tridentate appearance. Relative measurements (holotype): head width 36, head height 28, minimum frontovertex width 8, OPL 3, POL 3, OOL 1, eye length 24, eye width 20.5, malar space 13, scape length 15, scape width 2.5; other proportions of antennae similar to Fig. 251.

Mesoscutum with shallow imbricate-reticulate sculpture; scutellum flat, with distinctly deeper, very fine, punctate-reticulate sculpture, only extreme sides and apex smooth; forewing with venation and distribution of setae at base similar to Fig. 214, without conspicuous naked basal area basally, basal cell with only a few ventral setae; linea calva closed. Relative measurements (paratype): forewing length 76, forewing width 35; hindwing length 55, hindwing width 15.

Gaster longer than thorax and with apex very acute, pointed; ovipositor (Fig. 220) slightly exserted; hypopygium as in Fig. 218. Relative measurements (paratype): ovipositor length 50, gonostylus 10 [mid tibia 26].

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, BMNH Canopy Fog #16, 2.xii.1985. Paratype, INDONESIA: 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy Fog #13, 11.vii.1985. Material in BMNH.

COMMENTS. *Ooencyrtus clotho* is probably close to *clio* and *circe* but the females can be separated from these and others of the genus by the combination of very pale, whitish antennae and legs, strongly transverse head; flat and metallic thoracic dorsum with conspicuous setae and apically very acute gaster.

Ooencyrtus cybele sp.n.

(Figs 221–225)

DIAGNOSIS. Female: body generally dark brown; head and thoracic dorsum metallic green; all legs, including coxae, yellow; gaster dark brown; antennae mostly yellowish; pedicel plus flagellum slightly longer than head width; flagellum filiform, all funicle segments at least slightly longer than broad; F2–6 much longer than broad; clava hardly broader than F6, as long as F4–6 together; frontovertex about one-sixth head width; mandible with one tooth and broad, minutely denticulate truncation; scutellum with fine punctiform-reticulate sculpture; forewing (Fig. 222) with a conspicuous narrow basal naked area basally; linea calva open; gaster shorter than thorax and more or less rounded posteriorly; ovipositor hidden.

FEMALE. Length 0.8–1.15 mm (holotype 0.98 mm).

Head mostly metallic green, ocellar area shiny purplish brown; interantennal prominence purplish between toruli, ventrally delimited by a faint narrow bluish line; antennae testaceous-yellow except proximal half of pedicel brown; pronotum and axillae dark purple-brown; mesoscutum metallic blue-green; scutellum metallic green; mesopleuron and propodeum blackish; tegulae dark brown; legs, including coxae, yellow; wings hyaline, venation testaceous-yellow; gaster dark purple-brown with slight metallic green sheen on basal tergite; ovipositor sheaths dark brown.

Head on frontovertex with fine, regular, polygonally reticulate sculpture, much shallower between ocelli and antennal scrobes; lower parts of face and genae with irregular, elongate sculpture; ocelli forming an equilateral triangle; posterior ocelli separated from occipital margin by a

little more than their own lengths and nearly touching eye margins; eye not conspicuously hairy; frontovertex slightly more than one-sixth head width; occipital margin rounded; antennae inserted slightly below ventral eye margins (Fig. 224); toruli separated from mouth margin by about their own lengths; clypeal margin medially slightly convex (Fig. 224); antennae (Fig. 221) with pedicel plus flagellum slightly longer than head width; all funicle segments much longer than broad, sometimes F1 only slightly longer than broad; clava hardly broader than F6, as long as F4–6 together, and with sensory area small and at extreme apex only; mandibles with one tooth and a broad, minutely denticulate truncation. Relative measurements (holotype): head width 46, head height 40, minimum frontovertex width 8, OPL 4, POL 4, OOL 0.3, eye length 29, eye width 25.5, malar space 16, scape length 18, scape width 4; other proportions of antenna as in Fig. 221.

Mesoscutum with regular, imbricate-reticulate sculpture; scutellum slightly convex with much deeper, more or less regular, fine, punctate-reticulate sculpture, only the vertical sides and apex smooth and polished; forewing with venation and distribution of setae at base as in Fig. 222, with a conspicuous narrow, naked basal area, basal cell with only a few ventral setae near base; linea calva open; postmarginal vein very short, less than one-third length of stigmal vein. Relative measurements (paratype): forewing length 92, forewing width 41; hindwing length 65, hindwing width 15.

Gaster shorter than thorax, apex of last tergite truncate; ovipositor (Fig. 225) hidden; hypopygium as in Fig. 223. Relative measurements (paratype): ovipositor length 34, gonostylus 6 [mid tibia 34].

MALE. Unknown.

VARIATION. Very little in material available.

HOSTS. A parasitoid of the eggs of *Riptortus* sp. (Hemiptera: Alydidae).

DISTRIBUTION. Papua New Guinea.

MATERIAL EXAMINED. Type material. Holotype ♀, PAPUA NEW GUINEA: Bulolo, 13.xii.1982 (Z. Boucek). Paratypes, PAPUA NEW GUINEA: 1♀, Bubia near Lae, 15.xii.1982 (Z. Boucek); 10♀, Morobe Prov. Markham Valley, ex eggs of *Riptortus* sp. CIE A12822, 23.xii.1980 (G. Young) [erroneously identified by B.R. Subba Rao in 1981 as *Ooencyrtus erionotae* Ferrière]. Material in BMNH.

COMMENTS. The faint metallic blue line connecting the toruli, slightly produced medial part of the clypeal margin and minutely denticulate truncate part of the mandible suggest that *O. cybele* may be close to *elissa* and related species (see comments under *elissa*). It can be separated from these species by the characters given in the key, notably the completely yellow legs, unicolorous flagellum and uniformly reticulate scutellum. *O. cybele* is superficially similar to *pallidipes* but can be separated from this species on the dark brown ovipositor sheaths, sculpture of the scutellum and truncate apex of the last gastral tergite. In *pallidipes* the ovipositor sheaths are yellow, the posterior one-third or so of the scutellum is smooth or very nearly so and the last gastral tergite is apically rounded.

Ooencyrtus ooii Noyes

(Fig. 226)

Ooencyrtus ooii Noyes, 1991: 1617–1622. Holotype ♀, MALAYSIA: (BMNH, examined).

DIAGNOSIS. Female (length 0.8–1.15 mm): body generally dark brown or blackish; head metallic green in scrobal area; all legs, including coxae, yellow; mesoscutum weakly metallic green or blue-green, scutellum similar, anteriorly coppery; gaster dark brown; ovipositor sheaths honey-yellow; antennae with pedicel plus flagellum slightly longer than head width, F1–3 quadrate and clearly smaller than following three, F4–5 longer than broad and F6 subquadrate; mandible with two teeth and a truncation; scutellum convex with more or less regular punctate reticulate sculpture, extreme apex and sides smooth; forewing with a conspicuous naked basal area; linea calva open; postmarginal vein a little shorter than stigmal vein; gaster a little shorter than thorax; ovipositor (Fig. 226) slightly to distinctly exserted, about 1.5 times as long as mid-tibia. Male (length 0.5–0.8 mm): coloration similar to female but fore and hind legs often slightly dusky; frontovertex slightly more than one-third head width; antenna with F1 and F2 the smallest, F1 quadrate, F2 slightly longer than broad, other funicle segments at least twice as long as broad and clothed in long setae more than twice as long as diameter of segments; aedeagus nearly as long as mid tibia.

HOSTS. Reared from field collected prepupae of *Conopomorpha cramerella* (Snellen) and in the laboratory from *Acrocercops globulifera* Meyrick (Lep.: Gracillariidae) (Ooi in Ooi *et al.*, 1987; Noyes, 1991). Also recorded below from a leaf

miner on *Mangifera indica* and *Terminalia catappa* L.

USE IN BIOCONTROL. This species has been released recently in Malaysia (Sabah) for the control of *Conopomorpha cramerella* (Lepidoptera: Gracillariidae) a major pest of fruit, especially cocoa (as *Ooencyrtus* sp.) (CIBC, 1988, 1989, 1990).

DISTRIBUTION. Malaysia.

MATERIAL EXAMINED. Type material. Holotype ♀, MALAYSIA: Sabah, Tuaran, ex pupa of *Conopomorpha cramerella*, CIBC (M) 1065, 1.i.1988 (A.C.P. Ooi), B.M. TYPE HYM 5,3638. Paratypes, MALAYSIA: 4♀, 1♂, Selangor, ex larva of *Acrocercops globulifera*, CIBC(M)618, 23.ix.1986 (A.C.P. Ooi); 20♀, 6♂, same data as holotype; 28♀, 4♂, Sabah, Tuaran, lab reared, CIBC(M)1065, 1.i.1988 (A.C.P. Ooi); 3♀, 2♂, Selangor, Batu Tiga, gregarious parasite of larva of *Acrocercops globulifera*, CIBC(M)313, 28.ii.1986 (A.C.P. Ooi); 3♀, 1♂, Selangor, Serdang, ex *C. cramerella* cocoon NL 311, CIBC(M)588, 22.i.1986 (A.C.P.Ooi); 11♀, 8♂, Selangor, Batu Tiga, lab host: *A. globulifera*, CIBC(M)1095, 6.v.1988 (A.C.P. Ooi); 7♂, Selangor, Batu TigA, LAB HOST *A. globulifera*, CIBC(M)1096, 7.v.1988 (A.C.P. Ooi); 2♀, Malacca, P. Gadong, ex *Acrocercops* sp., CIBC(M)1085, 13.ii.1988 (A.C.P. Ooi); 4♀, 2♂, Malacca, ex *A. isonoma*, CIBC(M)1113, 8.vii.1988 (A.C.P.Ooi). Holotype in BMNH, paratypes in BMNH, TAMU, ZISP, USNM, PPRI, MARI.

Other material. MALAYSIA: 7♀, 1♂, Selangor, Tg. Karang, ex *Mangifera indica* leaf miner, 28.vi.1985, CIE A17206; 3♀, MARDI, ex *Terminalia catappa* L. leaf miner, CIE A17206, 22.II.1985. Material in BMNH.

COMMENTS. This species is quite similar to *Ooencyrtus crassulus* but, in addition to the characters given in the key, females of the two species can be separated readily by the different structure of the antennae. In *ooii* F4–6 are generally longer than broad, whilst in *crassulus* F4–6 are quadrate. The males can be separated by the relative lengths of the setae on the flagellum (see relavant descriptions), those of *crassulus* being relatively much shorter.

Ooencyrtus crassulus Prinsloo & Annecke

(Fig. 227)

Ooencyrtus crassulus Prinsloo & Annecke, 1978: 42–44. Holotype ♀, Western Samoa (ORSTOM, not examined).

DIAGNOSIS. Female (0.6–0.8 mm): body generally dark purple brown or blackish; head metallic green in scrobal area; mesoscutum with a faint blue sheen; scutellum matt but with apical one-third and sides with moderate to strong blue or purple lustre; all legs, including coxae, yellow; gaster dark brown, slightly paler basally; antennae (Fig. 227) with pedicel plus flagellum slightly longer than head width, F1–3 clearly smaller than F4–6, which are subquadrate; mandible with one tooth and a broad, hardly convex truncation; scutellum flat, with regular, fine, relatively deep reticulate sculpture in anterior half or so, posterior to this shallower and more elongate, the vertical sides and apex smooth; forewing with conspicuous naked area basally, basal cell with a narrow patch of ventral setae; linea calva open; postmarginal vein a little shorter than stigmal vein; gaster a little shorter than thorax; ovipositor about one-quarter longer than mid-tibia, usually hidden. Male (length 0.5–0.7 mm): coloration similar to female but fore and hind legs often slightly dusky; frontovertex about one-third head width; antenna with F1 and F2 the smallest, F1 quadrate, F2 slightly longer than broad, other funicle segments at least twice as long as broad and clothed in setae about 1.5 times as long as diameter of segments; aedeagus slightly more than half as long as mid tibia.

HOSTS. Recorded by Prinsloo & Annecke (1978) as a parasitoid of the eggs of *Othreis fullonia* (Lepidoptera: Noctuidae), but also recorded below from eggs of *Hippotion celerio* L. (Lepidoptera: Sphingidae).

DISTRIBUTION. Western Samoa.

MATERIAL EXAMINED. Type material. Paratype, 1♀, WESTERN SAMOA: Taputimu, ex eggs of *Othreis fullonia* (Clerk), iii.1975 (I. Swan). In BMNH.

Other material. WESTERN SAMOA: 3♀, 1♂, Langoanca, ex eggs of *Othreis fullonia*, 23.x.1986 (D. Sands); 5♀, Asao, ex eggs of *Othreis fullonia*, LPL 523(A523), 20.i.1988 (W. Liebregts); 23♀, 10♂, Upolu, ex eggs of *Hippotion celerio* L., 10.iv.1981 (H.J. Braune). Material in BMNH.

COMMENTS. *Ooencyrtus crassulus* is very close to *sphingidarum* and the two may in fact be synonymous. For the present we are maintaining the two as distinct species because the gaster of the female of *sphingidarum* is basally yellow and the scutellum is strongly transverse. In *crassulus* the

base of the gaster has only a slight hint of being paler and the scutellum is hardly broader than long. The antennae of the males of the two species are very similar. See also comments under *ooii* (above).

***Ooencyrtus lucina* sp.n.** (Figs 228–231)

DIAGNOSIS. Female: body generally yellowish; metanotum, propodeum and dorsal part of gaster dark brown; all legs, including coxae, yellow; gonostylus orange; frontovertex one-third head width; ocelli forming an equilateral triangle; antennae (Fig. 228) with pedicel plus flagellum as long as head width; funicle segments subquadrate, but F1–2 conspicuously smaller; clava slightly longer than F4–6 together; mandible with one tooth and a broad truncation; scutellum only slightly convex, with similar sculpture to mesoscutum but posterior margin smooth; forewing (Fig. 229) with conspicuous naked basal area; linea calva open posteriorly; postmarginal vein about as long as stigmal vein; ovipositor not exserted. Male: body generally dark brown; scrobal area metallic green; apex of scutellum metallic green; scape and pedicel yellowish, F1, F4 and clava dark brown, remainder of flagellum white; legs yellow; all funicle segments slightly longer than broad, longest setae about twice as long as diameter of segments (Fig. 231); aedeagus about half as long as mid tibia.

FEMALE. Length 0.55–0.70 mm (holotype 0.67 mm).

Frontovertex orange, face yellow; antennae yellow but first segment of clava dark brown; thorax dorsally orange, sides and venter yellow; metanotum and propodeum dark brown; legs, including coxae, yellow; wings hyaline, venation testaceous-yellow; gaster yellow but with dorsum, except basal tergite, dark brown; ovipositor sheaths orange.

Head in facial view clearly transverse, about 1.35 times as broad as high; frontovertex with fine, regularly raised, polygonally reticulate sculpture, genae with elongate sculpture; ocelli forming an equilateral triangle; posterior ocelli separated from occipital margin by their own lengths and distinctly separated from eye margins; eyes not conspicuously hairy; occipital margin quite sharp; antennae hardly inserted below ventral eye margins; toruli separated from mouth margin by less than their own lengths; antennae (Fig. 228) with pedicel plus flagellum about as long as head width; clava a little longer than F4–6 together, with sensory area at extreme apex only; mandibles with one tooth and a broad truncation. Relative measurements (holotype): head width 36, head height 32; minimum frontovertex width 12, OPL 3, POL 3, OOL 1.5, eye length 21, eye width 16, malar space 11.5, scape length 14, scape width 3; other proportions of antennae as in Fig. 228.

Mesoscutum with shallow imbricate-reticulate sculpture; scutellum mainly with similar sculpture and with only posterior vertical margin smooth; forewing with venation and distribution of setae at base as in Fig. 229, with conspicuous naked basal area, and basal cell with some scattered ventral setae; linea calva open; costal cell with only a single complete line of setae ventrally. Relative measurements (paratype): forewing length 77, forewing width 34; hindwing length 49, hindwing width 11.

Gaster shorter than thorax; ovipositor (Fig. 230) hidden. Relative measurements (paratype): ovipositor length 83, gonostylus 14 [mid tibia 71].

MALE. Length 0.58 mm. Similar in size and leg coloration to female, but differs markedly in general body coloration, colour and structure of antennae, relative width of frontovertex and genitalia. The body is generally dark purple-brown with scrobal area metallic green, interantennal prominence purple and mesoscutum and scutellum weakly brassy, apex of scutellum metallic green; antennae with scape, pedicel and apex of clava yellow, F1, F5 and basal half or so of clava brown, F2–4 and F6 white; frontovertex almost two-fifths head width, ocelli nearly forming a right angle, posterior ocelli about equidistant from occipital and eye margins; antennae (Fig. 231) with pedicel plus flagellum 1.4 times head width; all funicle segments slightly longer than broad and clothed in setae about twice as long as diameter of segments; aedeagus about half as long as mid tibia.

HOSTS. Reared from eggs of *Clostera cupreata* (Lepidoptera: Notodontidae).

DISTRIBUTION. India.

MATERIAL EXAMINED. Type material. Holotype ♀, INDIA: Uttar Pradesh, Haldwani, ex eggs of *Clostera cupreata*, IIE 22271, 3.xii.1991 (M. Ahmad). Paratypes, 7♀, 2♂, same data as holotype. Material in BMNH.

COMMENTS. This is perhaps the easiest species of the genus to recognise. The females are remarkably superficially similar to many species of *Metaphycus*, both having the body almost totally yellow or orange. Males, on the other hand, could be confused with males of some species of *Helegonatopus*, both having the flagellum similarly bicoloured. The host, mandibular structure

and strongly expanded mesopleuron separate *lucina* from species of these other two named genera. Species of *Metaphycus* are generally parasitoids of scale insects, *Helegonatopus* are hyperparastioids of Dryinidae, both have tridentate mandibles and the mesopleuron is not enlarged posteriorly and thus the metapleuron and propodeum are exposed laterally.

Ooencyrtus macula sp.n.

(Figs 232–238)

DIAGNOSIS. Female: head metallic blue-green; antennae pale yellow; dorsum of thorax orange, laterally brown; gaster with basal half or so pale yellow, apex dark brown; legs, including coxae, pale yellow; forewing (Fig. 232) with a median infuscate band; ovipositor sheaths pale orange; mandibles with one tooth and a broad truncation; antennae (Fig. 233) filiform with all funicle segments longer than broad; pedicel plus flagellum about 1.35–1.4 times head width; clava somewhat shorter than F4–6 together; frontovertex one-sixth head width; ocelli forming a strongly acute angle of about 30°; forewing (Fig. 232) with a closed, naked basal area; linea calva open; scutellum with fine, regular reticulate sculpture which is slightly deeper than that on mesoscutum, only posterior vertical margin smooth; ovipositor very slightly exserted. Male: similar to females but thorax generally dark brown, dorsum metallic green; forewing completely hyaline; frontovertex one-third head width; antennae (Fig. 238) with all funicle segments at least about 2 times as long as broad and clothed in setae about twice as long as diameter of segments.

FEMALE. Length 1.05–1.30 mm. (holotype 1.2 mm).

Head metallic blue-green on frontovertex, scrobal area and genae metallic green, interantennal prominence purple; radicle dark brown, rest of antenna pale yellow; face of pronotum dark brown, sides and hind margin yellowish; mesoscutum mainly orange but sometimes anteriorly brown with a slight metallic blue sheen; axillae and scutellum orange; tegulae and prepecta pale-yellow; mesopleuron mainly brown but anteriorly yellowish; propodeum medially yellow and laterally brown; forewing (Fig. 232) with a transverse, median fuscous band; veins testaceous but proximal part of parastigma and marginal vein smoky; gaster basally pale yellow and with apical half or so dark purple-brown; ovipositor sheaths yellow.

Frontovertex with very fine, regular, raised, polygonally reticulate sculpture; lower parts of face with similar sculpture but less fine, genae with slightly longitudinally elongate sculpture; ocelli forming a very acute angle of about 30°, posterior ocelli separated from occipital margin by about 1.5 times their own lengths and almost touching eye margins; frontovertex one-sixth head width; eyes with very fine but fairly conspicuous setae; occipital margin hardly rounded; head in facial view (Fig. 234) hardly broader than high; antennae inserted far below the ventral eye margin, toruli separated from mouth margin by at least their own lengths; antennae (Fig. 233) with pedicel plus flagellum 1.35–1.4 times head width; clava a little shorter than F4–6 together, with sensory area at extreme apex only; mandibles with one small tooth and a broad truncation. Relative measurements (holotype): head width 42, head height 42, minimum frontovertex width 7, POL 2.5, OPL 4.5, OOL 0.5, eye length 31, eye width 25, malar space 17, scape length 22, scape width 4.5; other proportions of antenna as in Fig. 233.

Mesoscutum with shallow imbricate-reticulate, almost polygonally reticulate sculpture; scutellum with similar but deeper and finer regular, raised sculpture and with only posterior vertical margin smooth; mesopleuron with shallow, longitudinally elongate reticulate sculpture; forewing with a median transverse infuscate band; venation and distribution of setae basally as in Fig. 232. Relative measurements (holotype): forewing length 105, forewing width 43; hindwing length 69; hindwing width 15.

Gaster conspicuously shorter than thorax; ovipositor (Fig. 236) slightly exserted; hypopygium as in Fig. 235. Relative measurements: ovipositor length 72; gonostylus 15.5 [mid tibia 51].

MALE. Length 0.78–0.92 mm.

Similar to females except for colour of thorax, frontovertex width, antennae and genitalia. Thorax generally dark brown, dorsum metallic green, extreme sides of mesoscutum orange; prepecta and tegulae yellowish; forewing completely hyaline; frontovertex one-third head width; antennae (Fig. 238) with pedicel plus flagellum 1.7 times head width, all funicle segments at least about 2 times as long as broad and clothed in setae up to about twice as long as diameter of segments; genitalia (Fig. 237) with aedeagus slightly longer than half length of mid tibia.

VARIATION. Very little in material available.

HOSTS. A gregarious parasitoid of the eggs of

Turnaca acuta (Lepidoptera: Notodontidae) on coconut.

DISTRIBUTION. India.

MATERIAL EXAMINED. Type material. Holotype ♀, INDIA: Tamil Nadu, Kamakumpeleyam, ex eggs of *Turnaca acuta* (Walker), 5.ii.1992 (S. Swamiappan). Paratypes, INDIA: 7♀, 3♂, same data as holotype; 6♀, 2♂, Tamil Nadu, Kallipaty, ex eggs of *Turnaca acuta* (Walker) i.1992 (S. Swamiappan). Material in BMNH.

COMMENTS. Females of *Ooencyrtus macula* can be distinguished from other species of the genus because of the unique coloration, i.e. metallic green head contrasting with orange thoracic dorsum, bicoloured gaster and infuscate forewing. Males should be recognised by the narrow orange borders to the metallic green mesoscutum and the bicoloured gaster.

Ooencyrtus hera sp.n.

(Figs 239–245)

DIAGNOSIS. Female: body generally dark brown or blackish; scrobal area metallic green; apical one-third and margin of scutellum shining metallic blue-green; legs, including coxae, yellow; gaster with at least basal tergite and venter orange; ovipositor sheaths dark brown, at least at apex; mandibles characteristic (Fig. 240), with one long tooth and an oblique, minutely denticulate truncation; frontovertex about one-quarter head width (Fig. 239); flagellum (Fig. 242) filiform, funicle segments all subquadrate or transverse, F1 conspicuously smaller than others; scutellum basally with punctate reticulate sculpture, completely smooth in posterior one-third or so; forewing with a conspicuous closed basal naked area; ovipositor very slightly exserted. Male: generally similar to female but frontovertex about one-third head width; F1 subquadrate, F2–6 distinctly longer than broad (Fig. 285); segments clothed in setae about as long as diameter of segments.

FEMALE. Length, including ovipositor: 0.7–1.05 mm (holotype 0.89 mm).

Head purple-brown on frontovertex, scrobal area metallic green, interantennal prominence purplish; scape yellow, pedicel brownish proximally on dorsal surface, flagellum testaceous-yellow; thorax blackish with a slight brassy sheen dorsally, apical, one-third or so scutellum shining blue-green; tegulae brown; legs, including coxae, yellow; wings hyaline, venation testaceous; gaster with basal tergite and venter yellow or testaceous, apex dorsally dark brown, sometimes whole gaster yellowish or testaceous; ovipositor sheaths dark brown, at least apically.

Head in facial view as in Fig. 239, slightly broader than high; frontovertex with shallow, regular, raised, polygonally reticulate sculpture, slightly rougher in ocellar area; sculpture on sides of face and genae longitudinally elongate; ocelli forming an angle of about 50°; posterior ocelli separated from occipital margin by half their lengths and clearly separated from eyes; eye with conspicuous short setae; occipital margin sharp; antennae inserted far below the ventral eye margin; toruli separated from mouth margin by about 1.5 times their own lengths; antennae (Fig. 242) with pedicel plus flagellum distinctly shorter than head width; clava with sensory area at extreme apex only; mandible (Fig. 240) with one long tooth and an oblique, minutely denticulate truncation. Relative measurements (holotype); head width 43, head height 40, minimum frontovertex width 10, POL 3.5, OOL 0.8, eye length 29, eye width 23, malar space 15, scape length 16; other proportions of antenna as in Fig. 242.

Mesoscutum with shallow, almost polygonal, imbricate-reticulate sculpture; scutellum in anterior two thirds or so with conspicuously deeper, regular, punctate-reticulate sculpture, posterior part abruptly smooth and shiny (similar to Fig. 106); forewing with venation and setation at base as in Fig. 243. Relative measurements (holotype): forewing length 90, forewing width 40.

Gaster distinctly shorter than thorax; ovipositor (Fig. 244) slightly exserted; hypopygium as in Fig. 241. Relative measurements (paratype): ovipositor length 50, gonostylus 13.5 [mid tibia 37].

MALE. Length 0.55–0.7 mm. Very similar to female but differs in coloration of the gaster, frontovertex width, structure of antennae and genitalia. Gaster totally dark brown; frontovertex about one-third head width; ocelli forming an angle of about 80°; antennae (Fig. 245) with pedicel plus flagellum about 1.4 times head width; funicle and claval clothed with setae about as long as width of segment; scutellum sculptured area about four-fifths of scutellum; aedeagus about three-fifths as long as mid tibia.

VARIATION. Little in material available except that mentioned above for coloration of female gaster.

HOSTS. Reared from eggs of *Hebomoia glaucippe* (Lepidoptera: Pieridae).

DISTRIBUTION. Thailand.

MATERIAL EXAMINED. Type material. Holotype ♀, THAILAND: 11.ii/23.ii.1990 (Ray Harberd). Paratypes, THAILAND: 24♀, 13♂, same data as holotype but various dates i–iii.1990. Material in BMNH, IZAS, ZISP, PPRI, USNM.

COMMENTS. *O. hera* is closest to *larvarum*, both species having very similar general habitus, mandibular structure with an elongate outer tooth, relatively long malar space, similar antennal structure in both sexes, ovipositor structure and hypopygium. The two species can be separated on a number of characters, but notably the coloration of the female gaster, relative width of the female frontovertex, and structure of the mandibles. In the female of *hera* the frontovertex is about one-quarter head width and the gaster is largely yellow or orange and in both sexes the truncate part of the mandible is oblique and minutely denticulate. The female of *larvarum* has the frontovertex about one-third head width, the gaster entirely dark brown, and in both sexes the mandible is tridentate. There are also differences in the relative proportions of the antennal segments of both sexes (compare Figs 242, 245 and 175, 180). In general habitus and coloration *hera* is remarkably similar to *papilionis* but clearly differs in the structure of the mandible and antenna. In *papilionis* the mandible has a broad, straight truncation and at least F1 and F2 are conspicuously smaller than the following segments. There is also a marked difference in the shape of the proximal part of the second valvifer of the ovipositor (compare Figs 244, 322, 323).

Ooencyrtus manii nom.nov.

(Figs 246–254)

Ageniaspis pyrillae Mani, 1939: 72. Holotype ♀, India (IARI, not examined).

Ooencyrtus papilionis Ashmead; Subba Rao, 1979: 147; 37–38; Hayat & Subba Rao, 1981: 117; Mohyuddin *et al.*, 1982; Asre *et al.*, 1983: Dhaliwal & Bains, 1983: 294–302; Rahim & Hashmi, 1984: 124–126; Madan *et al.*, 1985; Yadhav & Chaudhary, 1984: 162–166; 1985: 949–950; Gholap & Chandele, 1985: 235–236; Hayat, 1986;118; Chaudhary, et al. 1987: 15–20; Rajak *et al.*, 1987: 1–9; Rahim *et al.*, 1991: 774–775. misidentification

DIAGNOSIS. Female (length about 0.65–0.95 mm): head and thorax generally dark brown, gaster yellow or orange; scrobal area metallic green; mesoscutum weakly metallic blue; scutellum green mixed coppery; tegulae and legs, including coxae, yellow; gaster mainly yellow but margined dark brown distad of cercal plates; ovipositor sheaths yellow; head in facial view as in Fig, 247; mandible (Fig. 248) almost tridentate; antennae (Figs 250, 251) with flagellum slightly clavate; F1–5 a little longer than broad (Fig. 250), rarely transverse (Fig. 251), F6 subquadrate; clava apically rounded, as long as F4–6 together or longer, with sensory area slightly enlarged but limited to apex; scutellum (Fig. 246) slightly convex, with regular raised, punctate-reticulate sculpture, only the vertical posterior part smooth; forewing (Fig. 249) without a naked basal area; linea calva open; gaster about as long as thorax; ovipositor (Fig. 252) hidden or only a little exserted, a little longer mid tibia to 1.25 times as long as; hypopygium as in Figs 253 and 254. Male (length about 0.8–0.9 mm): all funicle segments at least about twice as long as broad and clothed in setae a little longer than diameter of segments; aedeagus about half as long as mid tibia.

HOSTS. A parasitoid of the eggs of *Pyrilla* spp., including the sugarcane pest, *Pyrilla perpusilla* (Homoptera: Lophopidae).

DISTRIBUTION. Pakistan, India.

MATERIAL EXAMINED. Non-type material. INDIA: 9♀, Uchani, Karnal, ex *Pyrilla perpusilla*, C.I.E. A10725, ? 1978; 3♀, 3♂, Punjab, Lyallpur, ex eggs of *Pyrilla* sp. 13.x.1931; 5♀, Punjab, Lyallpur, BM 1934–121 [identified by Ferrière as *Ooencyrtus ?papilionis* Ashmead]; 4♀, Delhi, IARI area, x.1979 (Z. Boucek); 3♀, Uttar Pradesh, Gola Gokarannath, ex eggs of *Pyrilla perpusilla*, CIE A16350, x.1981 (H. Nigam) [identified by B.R. Subba Rao, 1979, as *Ooencyrtus papilionis*]; 2♀, Tamil Nadu, 3km E. Manjaler Dam, BM 1979–518, 15–18.x.1979 (J.S. Noyes). Material in BMNH.

COMMENTS. Subba Rao (1979) incorrectly synonymised *Ageniaspis pyrillae* Mani with *Ooencyrtus papilionis* Ashmead. We have examined the type series of *papilionis* and Dr M. Hayat (Aligarh Muslim University) has kindly supplied us with his notes made from examination of the extant type material of *pyrillae* in the collections of the Indian Agricultural Research Institute, Delhi. It is clear the species are not synonymous, differing in mandibular structure, sculpture of the scutellum and setation at the base of the forewing. In *pyrillae* the mandibles are tridentate, the scutellum is uniformly punctate-reticulate with only the extreme posterior margin smooth and shiny and the forewing is without a conspicuous naked basal area. The mandibles of

papilionis have one tooth and a broad, straight truncation, the scutellum has progressively smoother sculpture posteriorly so that the posterior two-fifths is quite shiny and the forewing has a conspicuous naked basal area.

The species name *pyrillae* is preoccupied in *Ooencyrtus* by *Ooencyrtus pyrillae* Crawford, 1916.

Ooencyrtus manii is probably most closely related to *midas* both species having similar, general body coloration, mandibular structure, sculpture on scutellum, female clava apically rounded and forewing without a conspicuous naked basal area. Females of *O. manii* differs most significantly from those *midas* in coloration of gaster, relative lengths of flagellar segments and relative length of ovipositor. In *manii* the gaster is mainly yellow, but dorsally bordered dark brown in apical part only, the funicle segments are subquadrate and the ovipositor is only slightly longer than the mid tibia and not or hardly exserted. *O. midas* has the gaster mostly orange-brown dorsally with only the basal tergite yellow, F2–6 are strongly transverse and the ovipositor at least twice as long as the mid tibia and strongly exserted, the exserted part about as long as the mid tibial spur.

Ooencyrtus midas sp.n.

(Figs 255, 259)

DIAGNOSIS. Female: head and thorax generally dark brown; head weakly metallic green in scrobal area and on genae; mesoscutum metallic blue; scutellum shining blue-green at apex and sides; all legs, including coxae, yellow; gaster orange brown dorsally, but basally and ventrally orange; ovipositor sheaths orange-brown; mandibles tridentate; frontovertex a little less than one-third head width; ocelli forming an equilateral triangle; posterior ocelli clearly removed from eye margins; antennae (Fig. 256) with pedicel plus flagellum about 0.8 times head width; flagellar segments subquadrate or transverse; clava about as long as funicle, apex obliquely truncate and with sensory area enlarged and about half as long as clava; scutellum with regular, punctate-reticulate sculpture in anterior two-thirds, only posterior vertical margin smooth and shiny; forewing (Fig. 257) without a naked basal area, gaster distinctly shorter than thorax, ovipositor distinctly exserted. Male: similar to female but antenna with all funicle segments subquadrate and clothed in setae a little longer than diameter of segments; clava relatively small, not wider than funicle and hardly longer than F5–6 together; gaster more or less completely brown.

FEMALE. Length, excluding ovipositor, about 0.8 mm (holotype).

Head dark purple brown in ocellar area, metallic green in scrobal area, interantennal prominence purplish; antennae with radicle brown, scape yellow; pedicel and flagellum testaceous; pronotum, and axillae dark purple-brown; meoscutum weakly metallic blue; anterior two thirds of scutellum weakly shining coppery purple, posterior one-third shining blue-green; mesopleuron, prepectus and propodeum dark purple-brown; legs, including coxae, yellow; wings hyaline but with a very small, indistinct fuscous cloud below marginal vein, venation testaceous; gaster dorsally orange brown with basal tergite and venter yellow; ovipositor sheaths orange-brown.

Head with very shallow, regular, polygonally reticulate sculpture on frontovertex, anteriorly almost smooth; lower parts of face and genae with shallow elongate sculpture; ocelli forming an equilateral triangle; posterior ocelli separated from occipital margin by about their own lengths and clearly removed from eye margins; eyes naked; frontovertex slightly less than one-third head width (Fig. 255); antennae inserted well below ventral eye margin, toruli nearly touching mouth margin (Fig. 255); antennae with pedicel plus flagellum about 0.8 times as long as head width; pedicel as long as following three segments together; flagellum distinctly clavate; clava collapsed in all available material but as long as funicle, with an oblique outer suture and almost certainly with an oblique apical truncation, sensory area enlarged and about half as long as clava; mandibles similar to Fig. 283, with three teeth. Relative measurements (paratype): head width 36, head height 30, minimum frontovertex width 11, POL 4, OOL 1, eye length 21, malar space 12, scape length 15, scape width 3.5.

Mesoscutum with shallow almost polygonal, imbricate-reticulate sculpture; scutellum with deep regular punctate-reticulate sculpture in anterior two-thirds, posterior one-third becoming smoother so that apex is smooth and shiny; venation and distribution of setae of forewing at base as in Fig. 257, without a naked basal area; basal cell with some ventral setae posteriorly; linea calva nearly closed. Relative measurements (paratype): forewing length 90, forewing width 37, hindwing length 60, hindwing width 12.5.

Gaster distinctly shorter than thorax; ovipositor (Fig. 258) clearly exserted, the exserted part about as long as a mid tibial spur; hypopygium as

in Fig. 259. Relative lengths (paratype): ovipositor 70, gonostylus 19.5 [mid tibia 27].

MALE. Length about 0.8 mm.

Similar to female but differs in coloration of antennae and gaster, antennal structure, frontovertex width and genitalia. Antennae yellow, gaster completely dark brown; funicle segments subquadrate and clothed in setae which are about as long as diameter of segments, clava hardly broader than F6; frontovertex very slightly wider than in female.

HOSTS. Reared from homopteran eggs on coconut.

DISTRIBUTION. Philippines.

MATERIAL EXAMINED. Type material. Holotype ♀, PHILIPPINES: Matalag, ex eggs of a unidentified homopteran on coconut, CIE A16554, v.1984. Paratypes, PHILIPPINES: 2♀, 1♂, same data as holotype. Material in BMNH.

COMMENTS. *O. midas* is related to *libitina* and allied species (see comments under *libitina*), but is closest to *libitina*. Other than differences highlighted in the key to species, these two species differ in coloration, setation of the ventral surface of the costal cell of the forewing and structure of the hypopygium. In *midas* the mesopleuron is dark brown, the ventral surface of the costal cell has only a single complete row of setae ventrally and the posterior margin of the hypopygium is smooth, whereas in *libitina* the mesopleuron is orange, the costal cell has at least two complete rows of setae ventrally and the posterior margin of the hypopygium is minutely serrate. *O. midas* may be also be close to *manii* (see comments under *manii*).

Ooencyrtus mars sp.n.

(Figs 260–264)

DIAGNOSIS. Female: head and thorax generally dark brown or blackish; scrobal area metallic green; mesoscutum weakly metallic green; only apex of scutellum shiny; all legs, including coxae, yellow; gaster yellowish but dorsally with apical tergites brown; ovipositor sheaths brown; mandibles more or less tridentate; frontovertex a little less than one-third head width; antennae (Fig. 262) with all funicle segments strongly transverse and clava as long as funicle; sensory area of clava a little less than half length of clava; scutellum mainly with shallow sculpture, apical one-third smooth; ovipositor not, or hardly, exserted; hypopygium reaching apex of gaster or nearly so.

FEMALE. Length 0.6–0.81 mm (holotype 0.81 mm).

Head dark brown or blackish in ocellar area, scrobal area metallic green, interantennal prominence purple and genae metallic green mixed purple; antennae with radicle brown, scape yellow; pedicel and flagellum brown; pronotum, mesoscutum and axillae dark brown with a weak metallic blue sheen; anterior two-thirds of scutellum dark purple-brown and weakly metallic, posterior one-third blue-green, extreme apex purple; mesopleuron, prepectus and propodeum dark brown; legs, including coxae, yellow; wings hyaline, venation testaceous; gaster yellow but with apical tergites brown; ovipositor sheaths brown.

Frontovertex with relatively shallow, raised, polygonally reticulate sculpture; scrobal area with irregular, elongate sculpture; ocelli forming a slightly acute angle; posterior ocelli separated from occipital margin by at most their own lengths and not touching eye margins; eyes conspicuously hairy; occipital margin hardly rounded; frontovertex a little less than one-third head width; head in facial view (Fig. 260) about 1.2 times as broad as high; antennae inserted well below ventral eye margins; toruli separated from mouth margin by half their own lengths; antennae (Figs 262) with pedicel plus flagellum about 0.8 times as long as head width; flagellum conspicuously clavate; all funicle segments strongly transverse; clava distinctly broader than F6, and as long as funicle, outer suture slightly oblique but apex more or less rounded, sensory area extensive and slightly less than half as long as clava; mandibles similar to Fig. 268, more or less tridentate. Relative measurements (holotype): head width 32, head height 27, minimum frontovertex width 10, OPL 2, POL 4, OOL 1, eye length 20, eye width 16, malar space 11.5, scape length 12, scape width 3; other proportions of antenna as in Fig. 262.

Mesoscutum with shallow imbricate-reticulate sculpture; scutellum with similar, but even shallower, sculpture which gradually becomes weaker towards apex so that apical one-third or so is smooth and shiny; forewing (Fig. 261) without a conspicuous naked basal area; basal cell without ventral setae posteriorly; linea calva open. Relative measurements (paratype): forewing length 71, forewing width 31, hindwing length 50, hindwing width 12.

Gaster about as long as thorax; last tergite with an apical median incision; ovipositor (Fig. 264) not exserted or hardly so, about 1.35x as long as mid-tibia; hypopygium (Fig. 263) more or less reaching apex of gaster, and with a pair of

submedian thickened structures anteriorly. Relative measurements (paratype): ovipositor length 31, gonostylus length 6 [mid tibia length 23].

MALE. Unknown.

VARIATION. Little in material available.

HOSTS. Unknown.

DISTRIBUTION. Indonesia, Papua New Guinea, Brunei.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, 300m, BMNH Canopy Fog #6, 13.ii.1985. Paratypes, INDONESIA: 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 300m, v.1985 (J.S. Noyes); BRUNEI: 1♀, Bukit Sulang near Lamunin, BM 1982–388, Canopy Fog #3, 20.viii–10.ix.1982 (N.E. Stork); PAPUA NEW GUINEA: 1♀, Port Moresby, 20.xii.1982 (Z. Boucek). Material in BMNH.

COMMENTS. *Ooencyrtus mars* can be separated from other species of the genus by the unique combination of strongly transverse funicle segments with clava as long as funicle, tridentate mandibles, medially incised apical gastral tergite and hypopygium reaching apex of gaster.

Ooencyrtus neptunus sp.n.

(Figs 265–268)

DIAGNOSIS. Female: head and thorax generally dark brown or blackish; scrobal area metallic green; mesoscutum and scutellum with a slight metallic lustre; all legs, including coxae, yellow, mid femur and tibia either side of knee, each with a subapical dark brown ring; gaster nearly totally yellow but brownish along sides and at apex; ovipositor sheaths yellow; mandibles (Fig. 268) tridentate; frontovertex about one-fifth head width; antennae with pedicel plus flagellum as long as head width; F1–3 transverse and much smaller than F4–6; clava as long as F3–6 together; scutellum (Fig. 267) nearly flat, with regular punctate-reticulate sculpture in basal two-thirds and only vertical margin smooth and shiny; forewing (Fig. 265) without a conspicuous naked basal area; linea calva open; ovipositor hidden or hardly exserted.

FEMALE. Length 0.65–0.85 mm (holotype 0.70 mm).

Frontovertex dark coppery purple to slightly bluish; scrobes metallic green; interantennal prominence purple; genae purple mixed brassy and green; antennae mainly yellow, dorsal side of scape and base of pedicel brown; pronotum blackish; mesoscutum and axillae blackish with a weak to moderately strong blue sheen; scutellum mainly matt black, perhaps slightly green or purple, vertical sides and apex shining blue-green; mesopleuron and propodeum dark brown; legs, including coxae, yellow, but mid legs with a pair of brown rings either side of knees, these sometimes also present on fore and hind legs; wings hyaline, venation testaceous-yellow; gaster mainly yellow but sides and apex brown; ovipositor sheaths yellow.

Frontovertex with fairly shallow, polygonally reticulate sculpture, quite smooth between anterior ocellus and top of scrobes; scrobal area and genae with irregular, elongate sculpture; frontovertex about one-fifth head width; ocelli forming an angle of about 45–50°; posterior ocelli separated from occipital margin by about twice their own lengths and nearly touching eye margins; eyes not conspicuously hairy; occipital margin more or less rounded; antennae inserted well below ventral eye margins; toruli separated from mouth margin by less than their own lengths; antennae with pedicel plus flagellum about as long as head width; F1–3 transverse and much smaller than F4–6; F4–5 longer than broad, F6 subquadrate; clava slightly broader than F6, about as long as F3–6 together, with sensory area at extreme apex only; mandibles tridentate (Fig. 268). Relative measurements (holotype): head width 26, head height 24, minimum frontovertex width 5.5, OPL 3, POL 2, OOL 0.3, eye length 18, eye width 17, malar space 9, scape length 12, scape width 2.3.

Mesoscutum with shallow, almost polygonal, imbricate-reticulate sculpture; scutellum (Fig. 267) with fairly regular distinctly deeper, polygonal to elongate reticulate sculpture in basal two-thirds, towards apex slightly shallower and irregular, only vertical sides and apex smooth and shiny; forewing with venation and distribution of setae at base as in Fig. 265, without conspicuous naked basal area, basal cell with one ventral row of setae posteriorly; linea calva open. Relative measurements (paratype): forewing length 69, forewing width 29; hindwing length 48 hindwing width 10.

Gaster slightly longer than thorax; ovipositor (Fig. 266) at least slightly exserted. Relative measurements (paratype): ovipositor length 32, gonostylus 6.5 [mid-tibia 25].

MALE. Unknown.

VARIATION. Very little in material available except that mentioned above under coloration.

HOSTS. Unknown.

DISTRIBUTION. Nepal, Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi, Utara, Dumoga-Bone NP, Toraut, BMNH Canopy #19, 30.ix.1985. Paratypes, NEPAL: 2♀, nr Birganj, Lothar 550m, 12–17.ix.1967 (Can. Nepal Exp.); INDONESIA: 1♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, BMNH Canopy #19, 30.ix.1985; 2♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, 300m, BMNH Canopy #4, 8.ii.1985; 1♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, BMNH Canopy #11, 10.iii.1985; 6♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy #13, 11.vii.1985; 1♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, BMNH Canopy #15, 19.vii.1985; 2♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, BMNH Canopy #16, 2.xii.1985; 1♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, Canopy Fog, v.1985 (J.H. Martin). Material in BMNH, MZB, CNC.

COMMENTS. This species is superficially similar to *utetheisae* but differs in having tridentate mandibles and brown anelli on at least the mid femora and tibiae. In *Ooencyrtus utetheisae* the mandibles have one tooth and a broad truncation and completely immaculate legs.

Ooencyrtus libitina sp.n.

(Figs 269–272)

DIAGNOSIS. Females: head and dorsum of thorax mostly metallic green or blue-green; prepectus and mesopleuron pale orange; all legs, including coxae, yellow; gaster pale orange but apical tergites dorsally brown; ovipositor sheaths orange to pale brown; mandibles more or less tridentate; frontovertex about one-quarter head width; flagellum (Fig. 270) clavate with funicle segments subquadrate or transverse; clava obliquely truncate, much broader than F6 and at least as long as F3–6 together, sensory area enlarged and slightly less than half length of clava; mandible more or less tridentate; scutellum with fairly regularly punctate-reticulate sculpture; ovipositor clearly exserted.

FEMALE. Length, excluding ovipositor, 0.80–1.15 mm (holotype 0.96 mm).

Head generally metallic green, ocellar area with purple reflections, interantennal prominence purple; antennae with radicle brown, scape yellow, pedicel and flagellum testaceous-yellow; pronotum and axillae purple-brown; mesoscutum metallic blue-green; scutellum green, only vertical margins strongly metallic; prepectus and mesopleuron pale orange; propodeum brown; legs, including coxae, yellow; wings hyaline, venation testaceous-yellow; gaster pale-orange, dorsally with apical tergites brown; ovipositor sheaths orange to pale brown.

Frontovertex with fairly shallow, regular, polygonally reticulate sculpture; in scrobal area and on genae more irregular and elongate; ocelli forming an equilateral triangle; posterior ocelli separated from occipital margin by about their own lengths and nearly touching eye margins; eyes not conspicuously hairy, clothed in numerous very fine, pale setae; occipital margin hardly rounded; frontovertex about one-quarter head width; head in facial view hardly broader than high; antennae inserted well bellow ventral eye margins; toruli separated from mouth margin by less than their own lengths; antennae (Fig. 270) with pedicel plus flagellum about as long as head width; funicle segments subquadrate or transverse; clava distinctly broader than F6, slightly longer than F3–6 together and apically obliquely truncate, with sensory area enlarged and only slightly less than half as long as clava; mandible more or less tridentate. Relative measurements (holotype): head width 33, head height 32, minimum frontovertex width 8, OPL 2.5, POL 3, OOL 0.5, eye length 22, eye width 18, malar space 12, scape length 16, scape width 3.5.; other proportions of antenna as in Fig. 270.

Mesoscutum with shallow, almost polygonal, imbricate-reticulate sculpture; scutellum mostly with deeper, punctate-reticulate sculpture, more elongate towards sides and apex, only vertical sides and apex smooth and shiny; forewing with venation and distribution of setae at base as in Fig. 271, with only a small naked basal area and basal cell with a few ventral setae posteriorly; linea calva open. Relative measurements (paratype): forewing length 95, forewing width 39; hindwing length 65, hindwing width 14.

Gaster slightly longer than thorax; ovipositor (Fig. 272), distinctly exserted, the exserted part about as long as mid tibial spur; hypopygium as in Fig. 269, the posterior margin minutely serrate. Relative measurements (paratype): ovipositor length 61, gonostylus length 15.5 [mid tibia length 31].

MALE. Unknown.

VARIATION. The mesopleuron is usually pale orange, but in one specimen it is pale orange-brown. The sculpture of the flattish dorsal part of the scutellum is normally more or less uniform but in one specimen the apex and sides are narrowly smooth and shiny.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy Fog #13, 11.vii.1985. Paratypes, INDONESIA: 2♀, same data as holotype; 2♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy Fog #11, 10.iii.1985; 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy Fog #15, 19.vii.1985; 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, FIT, ii.1985 (J.S. Noyes); 2♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, v.1985 (J.S. Noyes); 6♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, iv.1985 (J.S. Noyes); 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, 220–1100m, iv.1985 (J.S. Noyes). Holotype and paratypes in BMNH, paratypes in MZB, IZAS.

COMMENTS. *O. libitina* probably forms a discrete group of species with *vertumnus*, *midas*, *lupercus*, *lyaeus*, *vesta* and *maenas*, females of these species having a tridentate mandible and a conspicuously obliquely truncate clava. Of these species, *libitina* is probably closest to *vertumnus*, both species having the antennae situated about half the length of a torulus below the lowest eye margins, the clava conspicuously enlarged with sutures not strongly oblique, similar sculpture on the scutellum and a relatively long hypopygium with a minutely serrate posterior margin. *O. libitina* can be separated from *vertumnus* by the entirely orange mesopleuron, the largely orange gaster and the ovipositor less than twice as long as the mid tibia. In *O. vertumnus* the mesopleuron and gaster are dark brown and the ovipositor is at least twice as long as the mid tibia.

O. libitina may also be close to *midas* (see comments under *midas*).

Ooencyrtus lyaeus sp.n.

(Figs 273–276)

DIAGNOSIS. Female: head and thorax generally dark brown with weak metallic reflections, scutellum contrasting metallic green; all legs, including coxae, yellow; gaster yellow-brown; ovipositor sheaths yellow; mandible tridentate; frontovertex about one-fifth head width; antennae (Fig. 275) with flagellum clavate, funicle segments subquadrate or transverse; clava with an oblique apical truncation, and as long as F3–6 together, with sensory area enlarged but slightly less than half length of clava; scutellum with fairly uniform punctate-reticulate sculpture, extreme apex smooth; forewing (Fig. 276) with linea calva closed; ovipositor slightly exserted.

FEMALE. Length, excluding ovipositor, 0.93–1.15 mm (holotype 1.05 mm).

Frontovertex dark purple-brown, almost black, with a slight metallic green sheen, scrobal area metallic green, internatennal prominence purple, genae metallic green with purple reflection; antennae with radicle brown, scape yellow, pedicel and flagellum testaceous-yellow; pronotum and axillae dark purple-brown, mesoscutum similar but with a weak blue sheen; scutellum contrasting metallic blue-green; mesopleuron dark brown; propodeum brown; legs, including coxae, yellow; wings hyaline, venation testaceous-yellow; gaster brown-yellow; ovipositor sheaths pale orange.

Ocellar area with shallow, polygonally reticulate sculpture, anterior to this very shallow, almost smooth; scrobal area and genae with irregular, elongate sculpture; ocelli forming an angle of about 45°; posterior ocelli separated from occipital margin by about their own lengths and nearly touching eye margins; eyes not conspicuously hairy; occipital margin hardly rounded; frontovertex about one-fifth head width; head in facial view only slightly broader than high; antennae inserted well below the ventral eye margin; toruli separated from mouth margin by about half their own lengths; antennae (Fig. 275) with pedicel plus flagellum about as long as head width; clava distinctly broader than F6 and as long as F3–6 together, apex obliquely truncate and sensory area enlarged and only slightly less than half length of clava; mandible tridentate. Relative measurements (holotype): head width 37, head height 35, minimum frontovertex width 7.5, OPL 3.5, POL 3, OOL 0.3, eye length 25, eye width 22, malar space 14, scape length 18, scape width 3.5; other proportions of antennae as in Fig. 275.

Mesoscutum almost smooth but with very shallow imbricate-reticulate sculpture; scutellum with much deeper, fairly regular, punctate-reticulate sculpture, only extreme sides and apex smooth and very shiny; forewing with venation and distribution of setae at base as in Fig. 276, without conspicuous naked basal area, basal cell with a patch of ventral setae posteriorly; linea calva closed. Relative measurements (paratype): forewing length 96, forewing width 39; hindwing length 64, hindwing width 14.

Gaster slightly longer than thorax, almost rounded apically; ovipositor (Fig. 274) slightly exserted; hypopygium as in Fig. 273 and with posterior margin smooth. Relative measure-

ments (paratype): ovipositor length 49, gonostylus length 11 [mid tibia length 34].

MALE. Unknown.

VARIATION. Very little in material available.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, 450m, BMNH Canopy Fog #5, 11.ii.1985. Paratypes, INDONESIA: 7♀, same data as holotype; 2♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, BMNH Canopy Fog #3, 8.ii.1985; 3♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, BMNH Canopy Fog #13, 11.vii.1985. Holotype and paratypes in BMNH, paratypes in MZB.

COMMENTS. *O. lyaeus* belongs to the same group of species as *libitina* (see comments under *libitina*) and is probably closest to *lupercus*, *maenas* and *vertumnus*. It can be distinguished from *lupercus* and *maenas* by the presence of a distinct narrow patch of ventral setae posteriorly in basal cell; F1–3 subquadrate and clava as long as F3–6 and outer suture only slightly oblique. In both *lupercus* and *maenas* there is no conspicuous patch of ventral setae in basal cell posteriorly, F1–3 are conspicuously transverse and the clava is at least as long as F2–6 together and outer suture conspicuously oblique. *O. lyaeus* differs from *vertumnus* in having the antennal toruli at least their own lengths below the lowest eye margins, eyes with short but inconspicuous setae, ovipositor only about 1.5 times as long as the mid tibia, and posterior margin of hypopygium smooth. In *vertumnus* the antennal toruli are only about half their own lengths below the eye margins, the eyes are more or less completely naked, the ovipositor is about twice as long as the mid tibia and the posterior margin of the hypopygium is minutely serrate.

Ooencyrtus lupercus sp.n.

(Figs 277–281)

DIAGNOSIS. Female: head and thorax generally dark brown or blackish; head and dorsum of thorax with a metallic green lustre; antennae mostly yellow with clava brown; all legs, including coxae, whitish or pale yellow; gaster predominantly yellowish, apical tergites brown; ovipositor sheaths yellow; mandible tridentate; frontovertex about one-fifth head width; antennae (Fig. 277) with pedicel plus flagellum as long as head width; funicle segments subquadrate or transverse; clava as long as F2–5 together, with sutures oblique and a strong oblique apical truncation, sensory area occupying whole of truncate part; scutellum with fairly uniform punctate-reticulate sculpture and with only posterior margin smooth; forewing (Fig. 268) with only a small basal naked area; gaster longer than thorax; ovipositor slightly exserted.

FEMALE. Length 0.9–1.0 mm (holotype 0.97 mm).

Head metallic green, ocellar area and interantennal prominence purplish; antennae with radicle black, scape yellow, pedicel proximally brown and distally yellowish, funicle segments yellowish, clava brown but with truncate area yellowish; pronotum and axillae black with a purple sheen; mesoscutum with a metallic blue-green sheen; reticulate area of scutellum green with some coppery purple reflections, posterior margin metallic green; prepectus and mesopleuron dark purple-brown; propodeum brown; legs, including coxae, pale yellow; wings hyaline, venation testaceous-yellow; gaster mostly yellowish, sides and apical tergites brown; ovipositor sheaths yellow.

Frontovertex with fairly regular polygonally reticulate sculpture, a little deeper in ocellar area; genae with more irregular, elongate sculpture; ocelli forming an angle of about 45–50°; posterior ocelli separated from occipital margin by about 1.5 times their own lengths and nearly touching eye margins; eyes appearing naked; occipital margin slightly rounded; frontovertex about a little more than one-fifth head width; head in facial view nearly as long as broad with antennae inserted far below ventral eye margin, toruli separated from mouth margin by half their own lengths (Fig. 280); antennae (Fig. 277) with pedicel plus flagellum about as long as head width; clava distinctly broader than F6, about as long as F2–6 together, sutures oblique in profile, and apex distinctly obliquely truncate, with sensory part occupying whole of truncate area; mandibles similar to Fig. 283 with three acute teeth. Relative measurements (holotype): head width 36, head height 35, minimum frontovertex width 7.5, OPL 4, POL 2.5, OOL 0.3, eye length 25, eye width 21, malar space 14, scape length 16, scape width 3.5; other proportions of antennae as in Fig. 277.

Mesoscutum with shallow, almost polygonal, imbricate-reticulate sculpture; scutellum with conspicuously deeper, regular, punctate-reticulate sculpture and with only extreme apex and sides smooth and very shiny; forewing with

venation and distribution of setae at base as in Fig. 278, and without a conspicuous naked basal area, basal cell without ventral setae posteriorly; linea calva closed. Relative measurements (paratype): forewing length 93, forewing width 36; hindwing length 64, hindwing width 14.

Gaster conspicuously longer than thorax, last tergite broadly truncate; ovipositor (Fig. 279) very slightly exserted; hypopygium as in Fig. 281. Relative measurements (paratype): ovipositor length 41, gonostylus length 8 [mid tibia length 31].

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy Fog #13, 11.vii.1985. Paratypes, INDONESIA: 4♀, same data as holotype; 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, 450m, BMNH Canopy Fog #5, 2.ii.1985; 2♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy Fog #15, 19.vii.1985. Holotype and paratypes in BMNH, paratype in MZB.

COMMENTS. *Ooencyrtus lupercus* belongs to the same group of species as *libitina* (see comments under *libitina*) and is probably closest to *maenas* and *lyaeus*. In addition to the characters given in the key, both *lupercus* and *maenas* can be separated from *lyaeus* by having F2–4 conspicuously transverse and clava with a strongly oblique outer suture, whereas in *lyaeus* F2–4 are subquadrate and the outer suture of the clava is only slightly oblique. *O. lupercus* can be separated from *maenas* by having the clava about 2.5 times as long as broad with the sensory area about two-thirds as long as clava, linea calva closed and ovipositor about 1.3 times as long as mid tibia. In *maenas* the clava is about twice as long as broad, the sensory part is about half as long as clava, the linea calva is open and the ovipositor is about 1.8 times as long as the mid tibia.

Ooencyrtus maenas sp.n.

(Figs 282–285)

DIAGNOSIS. Head and thorax generally dark brown or blackish; head metallic green in scrobal area; mesoscutum weakly shining blue; scutellum metallic green mixed coppery purple; all legs, including coxae, pale yellow; gaster mostly yellow but sides and apical tergites brown; ovipositor sheaths orange brown; mandible (Fig. 283) tridentate; frontovertex a little less than one-quarter head width; antennae (Fig. 282) with pedicel plus flagellum as long as head width; all funicle segments distinctly transverse; clava as long as F2–6 together, outer suture oblique, apex obliquely truncate and sensory area about half as long as clava; scutellum with uniformly punctate-reticulate sculpture, only extreme apex smooth; forewing without a distinct naked basal area; linea calva open; ovipositor very slightly exserted.

FEMALE. Length 0.97 mm (holotype).

Head blackish; ocellar area purplish, anterior to this bluish; scrobal area metallic green, interantennal prominence purplish; genae slightly brassy; antennae with radicle brown, proximal one-third of scape brown and distal two-thirds yellow; pedicel mainly yellow, but marked dorsally with brown in basal half; flagellum yellow; pronotum and axillae dark purple-brown; mesoscutum blackish with metallic blue tinge; reticulate area of scutellum slightly shiny coppery purple, sides and apex metallic green; prepectus and propodeum dark brown; mesopleuron dark purple-brown; legs, including coxae, pale yellow; wings hyaline, venation testaceous-yellow; gaster mostly yellow, its sides and apical tergites brown; ovipositor sheaths orange brown.

Frontovertex area with shallow, regular, polygonally reticulate sculpture; lower parts of face and genae with irregular, elongate sculpture; ocelli forming an angle of about 45°; posterior ocelli separated from occipital margin by about 1.5 times their own lengths and nearly touching eye margins; eyes appearing naked; occipital margin hardly rounded; frontovertex a little less than one-quarter head width; head in front view nearly as high as broad; mandibles (Fig. 283) with three acute teeth; antennae inserted well bellow ventral eye margin; toruli separated from mouth margin by about half their own lengths; antennae (Fig. 282) with pedicel plus flagellum about as long as head width; flagellum clavate; all funicle segments distinctly transverse; clava distinctly broader than F6, about as long as F2–6 together, outer suture oblique, its apex obliquely truncate and sensory area about half as long as clava. Relative measurements (holotype): head width 32, head height 31, minimum frontovertex width 7.5, OPL 3, POL 2, OOL 0.3, eye length 23, eye width 19, malar space 14, scape length 15, scape width 3.5; other proportions of antenna as in Fig. 282.

Mesoscutum with shallow, almost polygonal, imbricate-reticulate sculpture; scutellum mostly with distinctly deeper punctate-reticulate sculp-

ture, only extreme sides and apex smooth and shiny; forewing without a conspicuous naked basal area, basal cell without ventral setae posteriorly; linea calva open. Relative measurements (paratype): forewing length 83, forewing width 33.

Gaster longer than thorax, apical tergite more or less broadly rounded; ovipositor (Fig. 284) very slightly exserted; hypopygium as in Fig. 285. Relative measurements (paratype): ovipositor length 39, gonostylus length 8 [mid tibia length 22].

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀, INDONESIA: Sulawesi Utara, Dumoga-Bone NP, Toraut, BMNH Canopy Fog #3, 8.ii.1985. Paratype, 1♀, same data as holotype. Material in BMNH.

COMMENTS. *O. maenas* is close to *lupercus* (see comments under *lupercus*) and *vesta* (see comments under *vesta*).

Ooencyrtus segestes Trjapitzin

(Figs 286–295)

Ooencyrtus segestes Trjapitzin, 1965: 320–321, ♀. Holotype ♀, Indonesia: Komodo Island (ZISP) [examined].

DIAGNOSIS. Macropterous and brachypterous forms known; head and thorax generally dark brown or blackish and with a metallic green lustre; antennae yellowish; all legs, including coxae, yellow; tegulae dark brown; wing venation yellowish; gaster yellow, with apical half or so, dark brown; mandibles (Fig. 290) with one tooth and a broad, minutely denticulate truncation; scutellum (Figs 288, 289) in basal half with similar sculpture to mesoscutum, apical half almost smooth; macropterous forms without a conspicuous naked basal area on forewing (Fig. 293), linea calva open posteriorly, postmarginal vein hardly developed; brachypterous forms with forewing (Figs 291, 292) not reaching distal margin of basal tergite of gaster. Female (length 0.65–0.95 mm): ovipositor sheaths dark brown; frontovertex about one third head width (Fig. 286); ocelli very small, separated from eyes by at least their own lengths; antennae (Fig. 287) filiform with all funicle segments distinctly longer than broad; ovipositor (Fig. 294) not or hardly exserted. Male: similar to female but frontovertex about two-fifths head width and all funicle segments 2–2.5 times as long as broad and clothed with setae about 2.5 times as long as diameter of segments (Fig. 295).

The female should be recognisable from the above diagnosis and figures provided. The male is described below.

MALE. Length 0.55–0.65 mm.

Colour as in diagnosis.

Frontovertex with regular raised, polygonally reticulate sculpture; ocelli quite small, forming an angle of about 120°; posterior ocelli about equidistant from eyes and occipital margin; eyes almost naked; occipital margin rounded; frontovertex about three-fifths head width; head in front view about 1.2 times as broad as high; antennae (Fig. 295) inserted at ventral eye margin; toruli separated from mouth margin by about twice their own lengths; antennae with pedicel plus flagellum about 1.65 times as long as head width.

Mesoscutum with shallow, imbricate-reticulate sculpture, slightly transversely elongate anteriorly; scutellum slightly convex, with similar sculpture nearly to apex, but this more shallow in apical one-third or so; macropterous forms with forewing similar to Fig. 293 without a naked basal area, basal cell without a patch of ventral setae posteriorly; linea calva open; postmarginal vein not distinctly developed.

Gaster slightly shorter than thorax; aedeagus about half as long as mid tibia.

HOSTS. Unknown, but possibly associated with Heteroptera in grasses since the type series was collected by sweeping *Imperata arundinacea* in palm savanna (*Borassus*) (Trjapitzin, 1965) and noted below from the edge of rice paddy.

DISTRIBUTION. India, Thailand, P.R. China, Malaysia, Indonesia.

MATERIAL EXAMINED. Type material. Holotype ♀ (macropterous), INDONESIA: Komodo Island, 5.viii.1962 (I. S. Darevsky) [one antenna and forewing on slide No. 1081,not examined]. Paratypes (brachypterous), 2♀, same data as holotype. Material in ZISP.

Non-type material. INDIA: 11♀, Delhi, IARI area, X.1979, (Z. Boucek); 9♀, 5♂, Uttar Pradesh, Aligarh, 8–10.xi. 1979 (J. Noyes); 2♀, 1♂, Karnataka, Bangalore, 19–23. ix.1979 (J.Noyes); 1♂, Karnataka, Bangalore, viii.1979 (T. Sankaran); 1♀, Tamil Nadu, Siruvani Forest, 30.ix.1979 (J. Noyes); THAILAND: 1♀, 1♂, Nan Province, Nan, edge of rice paddy, 31.viii.1985 (M.J.E. Reacher-Huber); P.R.

CHINA: 1♀, 1♂, Sichuan, Huili, vi.1961 (Liao Dingxi); MALAYSIA: 1♀, Sarawak, Long Lama, 13.ii.1987 (A. T. Finamore, C. Boxfield); INDONESIA: 8♀, 1♂, Sulawesi, Utara, Dumoga-Bone NP, Toraut, iv–v.1985, (J. Noyes); 1♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, v.1985 (A. D. Austin). Material in BMNH, ZISP, MZB, ZIAS, USNM, PPRI.

COMMENTS. *O. segestes* is most similar to *musa* and *ferrierei* (see comments under those species). It can be separated from similar extralimital species by having relatively shallow sculpture on the scutellum (not deeper than that on meoscutum) or the dark brown tegulae.

Ooencyrtus ferrierei Shafee, Alam & Agarwal

(Figs 296–299)

Ooencyrtus ferrierei Shafee, Alam & Agarwal, 1975: 97–98. Holotype ♀, India (ZAMU, not examined).

DIAGNOSIS. Female (length about 1–1.1 mm): head and thorax generally dark brown or blackish with a weak to moderate metallic green sheen on head and dorsum of thorax; tegulae dark brown; all legs, including coxae, yellow; gaster dark brown but yellow in basal one-third or so; ovipositor sheaths dark brown; head in facial view as in Fig. 296; mandibles with a very small tooth and very broad, minutely denticulate inner truncation; antennae (Fig. 297) with pedicel plus flagellum as long as head width; flagellum filiform, F1–4 longer than broad, F5–6 subquadrate; frontovertex about one third head width; scutellum at base with similar sculpture to mesoscutum, gradually becoming shallower towards apex, extreme apex smooth and shiny; forewing with postmarginal vein very short, not distinctly developed; ovipositor (Fig. 299) hardly exserted; hypopygium (Fig. 298) strongly transverse. Male (length about 0.9 mm): generally similar to female but antennae with all funicle segments about twice as long as broad and clothed in setae about 1.5 times as long as diameter of segments.

HOSTS. Reared from eggs of Hemiptera on *Solanum* sp. (Shafee *et al.*, 1975).

DISTRIBUTION. India, Indonesia.

MATERIAL EXAMINED. Type material. Paratypes, 3♀, INDIA: Uttar Pradesh, Nainital, Punthnagar, 12.vi.1967 (A.S. Shafee). Material in BMNH, USNM.

Other material. INDONESIA: 2♀, Java, Rakata Kecil, Krakatau Cent. Expdn., 20.ix.1984 (S.G. Compton). Material in BMNH.

COMMENTS. *O. ferrierei* is similar to macropterous specimens of *segestes*, both species having the legs completely yellow, gaster dark brown with basal part yellow, antennae of female more or less filiform, frontovertex relatively wide in both sexes, forewing without a conspicuous naked basal area, postmarginal vein of forewing hardly developed and similar relatively shallow sculpture on the scutellum. In addition to differences in the relative lengths of the flagellum and funicle segments (see key to species), *ferrierei* can be separated readily from *segestes* by the relative lengths of the gonostyli (compare Figs 294 and 299) and also in the shape of the hypopygium. In *ferrierei* the hypopygium has an almost straight posterior margin (Fig. 298) whilst in *segestes* the posterior margin of the hypopygium is clearly convex either side of the median incision.

Ooencyrtus leander sp.n.

(Figs 300–303)

DIAGNOSIS. Body relatively slender. Female: head and thorax generally dark brown; head and dorsum of thorax with a metallic green or blue-green sheen; antennae yellow; tegulae brown; all legs, including coxae, yellow; gaster yellow but bordered dark brown; ovipositor sheaths yellow; frontovertex about one-fifth head width; antennae (Fig. 300) with pedicel plus flagellum slightly longer than head width; flagellum filiform, all funicle segments longer than broad; clava as long as F4–6 together; mandible (Fig. 303) with two, or perhaps three outer teeth and slightly convex, minutely denticulate truncation; scutellum with shallow sculpture in anterior half, posterior half smooth and shiny; forewing (Fig. 301) with a conspicuous narrow naked basal area basally; linea calva open; postmarginal vein about one-third length of stigmal; ovipositor slightly exserted. Male: generally similar to female but gaster mostly brown dorsally, frontovertex about one-third head width and antennae with all funicle segments at least twice as long as broad and clothed in setae 3–4 times as long as diameter of segments.

FEMALE. Length about 0.9 mm (holotype 0.93 mm).

Head mainly metallic green, ocellar and postocellar area with slight coppery reflections; interantennal prominence metallic purple above toruli; radicle brown, rest of antennae yellow; pronotum and axillae dark purple-brown, weakly

shiny; mesoscutum shining green or blue-green; anterior two-thirds of scutellum coppery purple, sides and apical one-third metallic green, slightly brassy; mesopleuron and propodeum dark purple-brown; tegulae dark brown; legs, including coxae, yellow; wings hyaline, venation testaceous-yellow; gaster almost totally yellow, but margined dark brown, more strongly so anterior to cerci; ovipositor sheaths yellow.

Frontovertex with fine, polygonally reticulate sculpture; lower parts of face and genae with more irregular elongate sculpture; ocelli more or less forming an equilateral triangle; posterior ocelli separated from occipital margin by their own lengths and touching eye margins; eyes with short inconspicuous setae; frontovertex one-quarter to one-fifth head width; occipital margin hardly rounded; antennae inserted just below ventral eye margin; toruli separated from mouth margin by about their own lengths; clypeus very slightly produced medially; antennae (Fig. 300) filiform with pedicel plus flagellum about 1.1 times as long as head width; clava about as long as F4–6 together, with sensory area at extreme apex only; mandibles (Fig. 303) with two or perhaps three outer teeth and an inner convex, minutely denticulate truncation. Relative measurements (holotype): head width 30, head height 28, minimum frontovertex width 7.5, OPL 3, POL 3, OOL 0, eye length 21, eye width 19, malar space 11, scape length 12, scape width 2.5; other proportions of antennae as in Fig. 303.

Mesoscutum with shallow imbricate-reticulate sculpture; scutellum slightly convex, in anterior half with very shallow sculpture as on mesoscutum, this becoming shallower posteriorly so that posterior half is almost completely smooth and shiny; forewing with venation and distribution of setae at base as in Fig. 301, with a narrow oblique naked basal area, basal cell without ventral setae posteriorly; linea calva open; postmarginal vein about one-third stigmal vein. Relative measurements (paratype): forewing length 90, forewing width 34; hindwing length 64, hindwing width 13.

Gaster as long as thorax; ovipositor (Fig. 302) slightly exserted; hypopygium similar to Fig. 298. Relative measurements (paratype): ovipositor length 40, gonostylus 8 [mid tibia 34].

MALE. Length 0.9 mm.

Generally similar to female but differs in having the gaster darker, relative width of frontovertex, antennal structure and genitalia. Dorsum of gaster almost completely dark brown; antennae about 1.7 times as long as head width; all funicle segments at least twice as long as broad and clothed with long setae, the longest of which is 3–4 times as long as diameter of segments; frontovertex one-third head width; ocelli forming a right angle, posterior ocelli separated from eye margins by their own lengths.

VARIATION. Very little in material available other than that mentioned under coloration and frontovertex width above.

HOSTS. Unknown.

DISTRIBUTION. Papua New Guinea.

MATERIAL EXAMINED. Type material. Holotype ♀, PAPUA NEW GUINEA: Madang Province, Laing, xi.1982 (P. Grootaert). Paratypes, PAPUA NEW GUINEA: 6♀, 1♂, same data as holotype; 19♀, 5♂, Madang Province, Laing, 20.vi.1982 (P. Grootaert), other data same as holotype; 12♀, Madang Province, Laing, vii.1982 (P. Grootaert). Holotype and paratypes in BMNH, paratypes in IZAS, QMB, ZISP, IRSN, MZB.

COMMENTS. *O. leander* is very close to *minor* (Perkins) (**comb.n.** from *Ectopiognatha*) and *major* (Perkins) (**comb.n.** from *Ectopiognatha*) known only from Queensland, Australia. It differs from these species in having a subcylindrical scape in the female and different mandibular structure. In both *major* and *minor* the female scape is distinctly broadened and fattened and the mandibles have four teeth. The mandibular structure and slightly produced clypeal margin also suggests that *leander* may be close to *elissa*, etc. (see comments under *elissa*), but can be separated from these species by lacking the faint metallic line connecting the ventral margins of the toruli and by having a largely yellow gaster.

Ooencyrtus musa sp.n.

(Figs 304–307)

DIAGNOSIS. Female: head and thorax dark brown or blackish with a metallic blue-green sheen on head and mesoscutum; antennae yellow, scutellum anteriorly coppery and posteriorly metallic green; tegulae dark brown; all legs, including coxae, yellow; gaster yellow basally and dark brown apically; ovipositor sheaths dark brown; mandibles with one tooth and a broad straight, minutely denticulate truncation; antennae (Fig. 304) filiform, all of funicle segments distinctly longer than broad; frontovertex about one-fifth head width; anterior half of scutellum (Fig. 305) with shallow sculpture, posterior half and sides smooth and shiny; forewing without conspicuous naked basal area; postmarginal vein

about one-third length of stigmal; ovipositor not exserted.

FEMALE. Length 0.78–0.85 mm (holotype 0.78 mm).

Head blackish with a metallic green lustre, ocellar area with slight coppery reflections; interantennal prominence purple; genae distinctly brassy; radicle black, pedicel and flagellum yellow; pronotum and axillae dark purple brown, slightly shiny; mesoscutum metallic blue-green; scutellum in anterior two-thirds or so coppery purple, posteriorly and at sides metallic green; mesopleuron and propodeum dark purple-brown; legs, including coxae, yellow; wings hyaline, venation testaceous-yellow; anterior half of gaster yellow, posterior half dark brown, blackish; ovipositor sheaths dark brown.

Frontovertex with regular, polygonally reticulate sculpture; genae almost smooth but with shallow, irregular elongate sculpture; posterior ocelli separated from occipital margin by their own lengths and nearly touching eye margins; eyes with short inconspicuous setae; occipital margin hardly rounded; frontovertex about one-fifth head width; antennae inserted just below ventral eye margins; toruli separated from mouth margin by their own lengths; antennae (Fig. 304) with pedicel plus flagellum slightly longer than head width; flagellum filiform, all funicle segments distinctly longer than broad; clava slightly longer than F4–6 together; mandible with one small tooth and a straight, broad, minutely denticulate truncation. Relative mea-surements (holotype): head width 37, head height 30, minimum frontovertex width 8, OPL 2, OPL 4, OOL 0.3, eye length 24, eye width 20, malar space 12, scape length 17, scape width 3.5; other proportions of antennae as in Fig. 304.

Mesoscutum with shallow imbricate-reticulate sculpture; scutellum (Fig. 305) slightly convex, with delicate similar, but more polygonal sculpture anteriorly which gradually becomes shallower towards apex and sides so that posterior one-quarter and sides are smooth; forewing without a naked basal area, basal cell without ventral setae; linea calva open; postmarginal vein about one-third length of stigmal. Relative measurements (paratype): forewing length 95, forewing width 40, hindwing 63, hindwing 14.

Gaster slightly shorter than thorax; ovipositor (Fig. 307) hidden; hypopygium as in Fig. 306. Relative lengths (paratype): ovipositor 34, gonostylus 6 [mid-tibia 33].

MALE. Unknown.

HOSTS. Unknown.

DISTRIBUTION. India.

MATERIAL EXAMINED. Type material. Holotype ♀, INDIA: Karnataka, Bannerghatta N.P., 5.xi.1979 (Z. Boucek & J.S. Noyes). Paratypes, INDIA: 2♀, same data as holotype. Material in BMNH.

COMMENTS. *Ooencyrtus musa* is generally similar to *segestes* and *ferrierei*, all three species having comparable coloration, filiform antennae and relatively shallow sculpture on the scutellum. *O. musa* can be separated from these species by the relative width of the frontovertex (see key).

Ooencyrtus telenomicida (Vassiliev)

(Figs 308–313)

Encyrtus telenomicida Vassiliev, 1904: 117–118. Syntypes, central Russia, (ZISP, not examined).

Schedius flavofasciatus Mercet, 1921: 315. Lectotype ♀, Spain (IEE, examined). Synonymy with *telenomicida* by Ferrière & Voegele, 1961: 32.

Ooencyrtus telenomicida (Vassiliev); Romanova, 1953: 238,240,246.

DIAGNOSIS. Female (length about 0.85–1.10 mm): body compact; head and thorax dark brown or blackish, head metallic green usually with coppery, purple and bluish reflections on lower parts of face and especially on interantennal prominence; antennae testaceous-yellow to pale brown; mesoscutum metallic green with fairly conspicuous silvery setae; scutellum in basal two-thirds coppery purple, apex and sides metallic green; tegulae dark brown; all legs, including coxae, yellow; gaster blackish but yellow at base; ovipositor sheaths dark brown; antennae (Fig. 308) with pedicel plus flagellum distinctly longer than head width; flagellum filiform and all funicle segments much longer than broad; frontovertex about one-quarter to nearly one-third head width; head in facial view (Fig. 312) about 1.1 times as broad as high; mandible with one tooth and a broad truncation; scutellum (Fig. 309) with longitudinally elongate reticulate sculpture in anterior two-thirds or so, posterior part smooth and shiny; forewing (Fig. 310) with setae in basal cell quite dense but with a small naked basal area; marginal vein almost quadrate and postmarginal vein very short; gaster slightly shorter than thorax; ovipositor (Fig. 311) hardly exserted and as long as mid-tibia; hypopygium as in Fig. 313. Male (length about 0.55–0.95 mm): generally similar to female, but gaster normally entirely dark brown, antennae with all funicle

segments at least twice as long as broad and clothed in setae about 2.5 times as long as diameter of segments.

HOSTS. Recorded as a parasitoid of the eggs of *Eurygaster integriceps* (Vassiliev, 1904) and *Aelia* sp. (see Trjapitzin, 1989) (Hemiptera: Scutelleridae) and *Dolycoris penicillatus* (Hemiptera: Pentatomidae) (see Myartseva, 1984). Recorded here as a parasitoid of eggs of *Gonocerus juniperi* on juniper (Italy) and *Brachynema germarii* (Italy). Reared in the laboratory on eggs of *Taragama repanda* (Lepidoptera: Lasiocampidae) and *Amorpha populi austanti* (Lepidoptera: Sphingidae) (see Trjapitzin, 1989). Also recorded here as laboratory reared from of eggs of *Gonocerus acutangulatus* (Italy).

DISTRIBUTION. Throughout southern and central Europe, north Africa, Turkey, middle East, Turkmenia, Uzbekistan, Kazakhstan, central Russia, Pakistan.

MATERIAL EXAMINED. Type material. Lectotype ♀ of *Schedius flavofasciatus* Mercet, SPAIN: Cercedilla, 12.viii.1916. In IEE.

Other material. PAKISTAN: 1♀, Chitral Shenyak, 3350m.vii–viii.1984 (W.J. Budenberg); 1♀, 1♂, Hindu Kush, 3550m, viii.1984 (W.J. Budenberg). Material in BMNH.

Extralimital material. ARMENIA: 5♀, 2♂, Sharnukh, 10.ix.1956 (V.A. Trjapitzin) [determined by Trjapitzin as *Ooencyrtus telenomicida*]; TURKEY, BULGARIA, EGYPT, SPAIN, ISRAEL: 122♀, 22♂, various dates and localities. Material in BMNH.

COMMENTS. *Ooencyrtus telenomicida* is a distinctive species, being characterized in the female by the yellow base to the gaster, mandibular structure, filiform antennae, conspicuous silvery setae on the mesoscutum and sculpture of the scutellum. It is very close to, and may be synonymous with, two extralimital species, viz: *gonoceri* Viggiani (from Italy) and *acastus* Trjapitzin (Russian far east and Japan). It can be separated from these species only on very slight differences in sculpture on the scutellum.

Ooencyrtus papilionis Ashmead

(Figs 314–328)

Ooencyrtus papilionis Ashmead, 1905: 4–5. LECTOTYPE ♀ (here designated), Philippines (USNM, examined).

Ooencyrtus (Schedius) leucocerus Mercet 1922: 150–152. Lectotype ♀, Indonesia (IEE, examined). **Syn.n.**

Ooencyrtus malayensis Ferrière, 1931: 282–283. LECTOTYPE ♀ (here designated), Malaysia (BMNH, examined). **Syn.n.**

Ooencyrtus cochereaui Prinsloo & Annecke, 1978: 41–42. Holotype ♀, New Caledonia (ORSTOM, not examined). **Syn.n.**

OTHER CITATIONS. Indian records of this species from *Pyrilla purpusilla* are erroneous and refer to *manii* (see *manii*).

DIAGNOSIS. Female (length 0.7–1.1 mm). Head and thorax dark brown or blackish; head metallic green, but frontovertex and interantennal prominence purplish; mesoscutum metallic blue or blue-green; scutellum blue-green to coppery purple in basal half or so, apex metallic blue, green or purple; legs, including coxae, yellow; gaster yellow but apical tergites yellow brown to dark brown; ovipositor sheaths yellow; mandibles with one small tooth and a broad, very slightly convex truncation; antennae with proximal two or three funicle segments transverse or quadrate (Figs 317–319), F4–6 normally at least a little longer than broad; frontovertex about one-sixth to one-quarter head width (Figs 314 and 315); scutellum with shallow to moderately deep punctiform-reticulate sculpture anteriorly, posterior two-fifths or so smooth and shiny (Fig. 316); setation in basal cell of fore wing as in Figs 320–321; gaster shorter than thorax; ovipositor (Figs 322 and 323) not or hardly exserted, about one-third longer than mid tibia; hypopygium as in Figs 324–326. Male (length 0.5–0.7 mm): similar to female but generally darker and duller, gaster entirely brown or almost so; head in facial view as in Fig. 327; antennae (Fig. 328) with all funicle segments twice as long as broad, occasionally F1 and F2 only slightly longer than broad, the longest setae at least twice as long as diameter of segments; aedeagus about three-fifths as long as mid tibia.

HOSTS. Recorded below from eggs of various families of Lepidoptera: *Papilio agamemnon* (see also Brown, 1905), *Papilio memnon*, *Papilio polytes*, *Papilio helenus*, *Papilio demoleus* (see also Jalali & Singh, 1990), *Papilio rumanzovia* (see also Brown, 1905), *Papilio aegeus* (see also Catley, 1966), *Papilio* (=*Chilasa*) sp., *Troides helena* (Papilionidae); *Hypolimnas bolina*, *Kallima*, *Tanaecia julii*, *Ariadne ariadne*, *Phalanta phalantha*, *Junonia* (=*Precis*) *lemonias* (Nymphalidae); *Tirumala limniace*, *Euploea core*, *Danaus chrysippus* (Danaidae); *Hasora* sp. (Hesperiidae); *Heliconius charitonius* (Heliconiidae); *Chilo terenellus* (Pyralidae); *Othreis fullonia* (Noctuidae); *Aroa cometaris* (Lymantriidae);

Cephanodes hylas (Sphingidae). The record as a parasitoid of the eggs of *Erionota thrax* (Crawford, 1911; Lepesme, 1947) may be in error for *pallidipes*. Various records of this species (as *malayensis*) reared from the eggs of Hemiptera (e.g. Phillips, 1941; Otanes & Sison, 1941; Goot, 1949; Szent-Ivany & Catley, 1960; Catley, 1966; Sands, 1977; Young, 1982) are very probably misidentifications of *utetheisae*.

USE IN BIOCONTROL. *Ooencyrtus papilionis* is almost certainly the species introduced, as *Ooencyrtus* sp., from New Caledonia into Western Samoa for the control of *Othreis fullonia* (Lepidoptera: Noctuidae) (Waterhouse & Norris, 1987). This species was supposedly introduced into the Solomon Islands in 1937–1938 for the control of *Amblypelta cocophaga* (Hemiptera: Coreidae) (Phillips, 1941) and released in Papua New Guinea in about 1974 for the control of *Amblypelta theobromae* (Brown) (Young, 1982). Coulson, et al. (1988) also recorded this species as having been introduced into the United States (Massachussets) in 1981 for the control of *Anasa tristis* (Hemiptera: Coreidae) and *Nezara viridula* (Hemiptera: Coreidae). It is likely that in these last three cases the species was not *papilionis* but *utetheisae* (see comments above).

DISTRIBUTION. India, Sri Lanka, Thailand, Malaysia, S. China (Guangdong, see Liao *et al.*, 1987: 173–174), Philippines, Indonesia, Papua New Guinea, New Caledonia, Vanuatu, Solomon Is.

MATERIAL EXAMINED. Type material. Lectotype ♀ of *Ooencyrtus papilionis*, PHILIPPINES: Manila (Robt. Brown) (Type No. 8125, USNM) [according to Ashmead the material was reared from eggs of *Papilio* sp.] (USNM). Paralectotype of *Ooencyrtus papilionis*: 1♀, same data as lectotype (USNM). Lectotype of *Ooencyrtus leucocerus* Mercet: Isle de Java (IEE). Lectotype ♀ of *Ooencyrtus malayensis* Ferrière, MALAYA: Johore, ex ova of *Cephanodes hylas* L., 18.xii.1928 (G.H. Corbett), with a 'type' label, B.M. TYPE HYM. 5. 1,070 (BMNH). Paralectotypes of *Ooencyrtus malayensis* Ferrière, 6♀, 2♂, same data as lectotype except 5.1.1929; 10♀, 1♂, 5.1.1929, ex host 5646, other data as lectotype; 2♀, MALAYA: Kuala Lumpur, ex eggs of *Papilio agamemnon* L., 6.iii.1925 (G.H. Corbett); 1♀, ex host 5833, 14.ii.1929, other data as lectotype; 2♀, 2♂, ex. eggs of *Papilio polytes* L, 1.i.1921 (W.A. Lamborn), all bearing 'cotype' labels (all BMNH).

Other material. INDIA: 4♀, Karnataka, 25 km.. W. of Mudigere, B.M. 1979–518, 28.x–3.xi.1979 (S. Noyes); 1 ♀, Karnataka, Mudigere, B.M. 1979–518, 26.x–4.xi.1979 (J.S. Noyes); 5 ♀, 1 ♂, Bangalore Karnataka, ex eggs of Lepidoptera, CIE 20436, ii.1988 (S. K. Jalali). SRI LANKA: 16♀, 3♂, various localities, ex *Papilio demoleus* on Citrus limon, various dates, xii.1989–v.1990 (IIE 21373); THAILAND: 154♀, 26♂, Chedi Mae Khrua, ex *Papilio memnon*, various dates i–vi.1990 (Ray Harberd); 82♀, 24♂, Chedi Mae Khrua, ex *Papilio polytes*, various dates ii–iv.1990 (R. Harberd); 6♀, Chedi Mae Khrua, ex *Papilio helenus*, various dates i–ii.1990 (Ray Harberd); 8♀, 4♂, Chedi Mae Khrua, ex eggs of *Papilio demoleus*, various dates ii–iv.1990 (Ray Harberd); 30♀, 6♂, Chedi Mae Khrua, ex eggs of *Papilio rumanzovia*, various dates ii–iii.1990 (Ray Harberd); 18♀, 5♂, Chedi Mae Khrua, ex eggs of *Tirumala limniace*, various dates ii–iv.1990 (Ray Harberd); 11♀, 3♂, Chedi Mae Khrua, ex eggs of *Euploea core*, various dates, ii–iv.1990 (Ray Harberd); 8♀, Chedi Mae Khrua, ex eggs of *Ariadne ariadne*, various dates ii–ii.1990 (Ray Harberd); 3♀, 2♂, Chedi Mae Khrua, ex eggs of *Phalanta phalantha*, various dates ii–iii.1990 (Ray Harberd); 2♀, 1♂, Chedi Mae Khrua, ex eggs of *Precis lemonias*, 10.ii/22.ii.1990 (Ray Harberd); 2♀, 1♂, Chedi Mae Khrua, ex eggs of *Heliconius charitonius* (N), 4.ii/21.ii.1990 (Ray Harberd); 2♀, 1♂, Chedi Mae Khrua, ex eggs of *Danaus chrysippus*, various dates ii.1990 (Ray Harberd); MALAYSIA: 4♀, 2♂, Penang, ex eggs of *Papilio polytes* L., 1989, CIE A20495; 5♀, 1♂, Penang, ex eggs of *Hyp. bolina*, 1989, CIE A20495; 3♀, Penang, ex eggs of *Triodes helena*, 1989, CIE A20495; 2♀, 1♂, Penang, ex eggs of *Kallima* sp. 15.viii.1989, CIE A20574; 2♀, 1♂, Penang, ex eggs of *Tanaecia julii*, 20.iii.1990, CIE A21020; 3♀, Serdang UPM, *Hasora* parasite, CIE A20991; 2♀, Selangor Batu Tiga, ex *Chilasa* eggs (Lep. Papilionidae), CIE A21064, 5.v.1988 (A.C.P. Ooi); INDONESIA, 1♀, Java, Krakatau, Rakata Zwarte Hoek, 16.ix.1964 (S.G. Compton); 4♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, BMNH Canopy Fog #11, 10.iii.1985; 1♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, BMNH Canopy Fog #3, 8.ii.1985; 3♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 450m, BMNH Canopy Fog #5, 11.ii.1985; 7♀, Sulawesi Utara, Dumoga-Bone NP, Toraut, 200m, BMNH Canopy Fog #13, 11.vii.1985; 11♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, iv.1985 (J.S. Noyes); PAPUA NEW GUINEA: 2♀, 1♂, Port Moresby, ex eggs of *Papilio aegeus*, ii.1961 (A. Catley); 2♀, Port Moresby, Ramu Sugar Est., ex eggs of *Chilo terenellus* on sugarcane with *Telenomus*, CIE

A20355; 1♀, Bulolo, 13.xii.1982 (Z. Boucek); 1♀ Areme, Musgrave R., 9.xii.1982 (Z. Boucek); VANUATU: 2♀, Efate P.Q.S., ex eggs on *Colocasia esculenta*, 18.ix.1987 (D. Boe); NEW CALEDONIA: 4 ♀, 3 ♂, Qui Poin, ex eggs of *Othreis fullonia*, iv.1971 (P. Cochereau) [det. *Ooencyrtus cochereaui* by D.P. Annecke); SOLOMON Is.: 4 ♀, Honiara, ex eggs of *Aroa cometaris*, CIE A10962, 12.ii.1979 (S.J. Addison). Material in BMNH, USNM, CNC, PPRI, ZISP, MZB, TAMU.

COMMENTS. We have examined material of identified as *Ooencyrtus cochereaui* by Annecke from the same host and locality as the type series of this species and are confident that it must represent a geographical race of *papilionis*.

Amongst the syntypic series of *Ooencyrtus malayensis* are several specimens reared from the eggs of *Leptocorisa acuta* Thunberg (Heteroptera: Coreidae) that belong to *utetheisae*.

O. papilionis is very close to *sphingidarum*, *shakespearei* and *utetheisae* (see comments under relevant species). It is also superficially very similar to *hera* but differs strongly in mandibular structure.

Ooencyrtus sphingidarum Timberlake

Ooencyrtus sphingidarum Timberlake, 1941: 223–225. Holotype ♀, Marquesas Islands (BPBM, examined).

DIAGNOSIS. Female (length about 0.8 mm): body generally dark purple brown or blackish; head metallic green in scrobal area; mesoscutum with a faint blue sheen; scutellum matt but with apical one-third and sides with moderate to strong blue or purple lustre; all legs, including coxae, yellow; gaster dark brown, yellow basally; frontovertex one-quarter head width; antennae with F1–4 slightly transverse and a little smaller than F4–6, which are quadrate; mandible with one tooth and a broad, hardly convex truncation; scutellum flat, about 1.5 times as long as broad, with regular fine, relatively deep reticulate sculpture, only extreme sides and apex smooth and shiny; linea calva open; postmarginal vein a little shorter than stigmal vein; gaster a little shorter than thorax; ovipositor hidden. Male (length about 0.75 mm): similar to female but frontovertex nearly half head width; antenna with F1 subquadrate, F2–6 clearly longer than broad and clothed in setae about 1.5 times as long as diameter of segments.

HOSTS. According to Timberlake (1941) the type series was reared from sphingid eggs (probably *Chromis erotus eras*) on *Morinda citrifolia*.

DISTRIBUTION. Marquesas Islands.

MATERIAL EXAMINED. Type material. Holotype ♀, MARQUESAS IS: Nukuhiva, ex sphingid eggs, Nov.25.29 (Mumford and Adamson). Paratype, 1♂, same data as holotype. Material in BPBM.

COMMENTS. *O. sphingidarum* is very close to, and may be synonymous with, both *papilionis* and *crassulus*. It differs from *papilionis* in having the scutellum strongly transverse and longest setae on the male antennae only about 1.5 times as long as diameter of segments. In *papilionis* the scutellum is about one-third broader than long and the longest setae on the male antenna are at least twice as long as diameter of segments. For differences from *crassulus* see comments under that species.

Ooencyrtus shakespearei (Girault)

Coccidoxenus shakespearei Girault, 1923: 48. LECTOTYPE ♀ (here designated), Australia (QMB, examined).

Ooencyrtus shakespearei (Girault) Noyes & Hayat, 1984: 309.

DIAGNOSIS. Female (length 0.7–0.97 mm): head and thorax generally dark brown; head metallic green, interantennal prominence purple, genae sometimes coppery; antennae yellow; mesoscutum metallic blue; tegulae yellow in basal half; scutellum relatively dull, coppery purple, its margins shining green or blue-green; all legs, including coxae, yellow; basal half or so of gaster yellow, apex dark brown; ovipositor sheaths yellow; mandibles with one tooth and a broad, slightly convex truncation; frontovertex less than one-fifth head width; antennae filiform with pedicel plus flagellum about 1.1–1.2 times as long as head width; all funicle segments much longer than broad; clava hardly broader than F6, as long as F4–6 together; scutellum only slightly convex, with regular fine, punctate-reticulate sculpture which is distinctly deeper than imbricate-reticulate sculpture on mesoscutum, only extreme sides and apex smooth and shiny; forewing with a conspicuous closed, naked basal area; linea calva open; postmarginal vein about half stigmal vein; ovipositor very slightly exserted.

HOSTS. Recorded below as a hyperparasite of *Agonoxena pyrogramma* (Lepidoptera: Agonoxenidae).

DISTRIBUTION. Thailand, Indonesia, Papua New Guinea, Australia.

MATERIAL EXAMINED. Type material. Lectotype ♀, on slide under coverslip nearest label '*Coccidoxenus shakespearei* Type', with syntype of *Mirsyrpophagus columbi* and fragments of *Anagyropsis spongitus* Girault; according to Girault, 1923 the specimen was one of a pair collected at Nelson, Queensland, Australia (QMB).

Non type material. THAILAND: 1♀, Huai Kha Khaeng, ii.1986 (M.G. Allen); INDONESIA: 1♀, Sulawesi: Utara, Dumoga-Bone NP, Toraut, iv.1985 (J.S. Noyes); PAPUA NEW GUINEA: 3♀, Lae, Hyper. of *A. pyrogramma*, 1957 (R.W. Paine). Material in BMNH.

Extralimital material. AUSTRALIA: 1♀, Queensland, Tibrogargan, 5.vi.1980 (J.S. Noyes) [compared with lectotype]. In BMNH.

COMMENTS. *O. shakespearei* is very similar in general habitus and coloration to *papilionis* and *utetheisae*. It can be separated from both species on the yellow tegulae (although some specimens of *papilionis* may have tegulae which are orange brown basally), from *papilionis* by the relatively longer funicle segments and from *utetheisae* by the paler yellow or orange ovipositor sheaths. Otherwise the three species can be separated reliably on the characters given in the key.

Ooencyrtus utetheisae (Risbec)

(Figs 329–337)

Aenasioidea utetheisae Risbec 1951: 141–143. Syntypes ♀♂, Ivory Coast (MNHN, not examined).

Ooencyrtus patriciae Subba Rao, 1981: 39–41. Holotype ♀, Nigeria (BMNH, examined). Synonymy with *utetheisae* by Prinsloo, 1987: 9–10.

Ooencyrtus utetheisae (Risbec); Prinsloo, 1987: 9–10.

DIAGNOSIS. Female (length 0.75–1.22 mm): head and thorax generally dark brown or blackish; head weakly metallic green or blue, purplish on interantennal prominence; mesoscutum metallic blue; scutellum dark coppery purple on reticulate part, extreme apex and sides greenish; all legs, including coxae, yellow; gaster yellow or orange bordered dorsally dark brown or blackish; outer plates of ovipositor and ovipositor sheaths dark brown; mandibles with a small outer tooth and a broad minutely denticulate truncation (Fig. 333) or without an outer tooth (Fig. 334); frontovertex about one-quarter head width or narrower; antennae (Figs 329 and 331) more or less filiform with pedicel plus flagellum slightly longer than head width; all funicle segments longer than broad; clava hardly broader than F6, as long as F4–6 together; scutellum only slightly convex, with fine regular punctate-reticulate sculpture extreme sides and apex smooth; forewing (Figs 330 and 332) without a conspicuous naked basal area, and basal cell without distinct ventral setae posteriorly; linea calva open; postmarginal vein about half stigmal vein; ovipositor (Fig. 335) hidden, or hardly exserted, about as long as mid-tibia; hypopygium as in Fig. 336. Male (length 0.55–0.95 mm): generally similar to female, but frequently more strongly metallic green on head and thoracic dorsum; gaster totally brown, occasionally yellowish towards base; frontovertex two-fifths head width; antennae (Fig. 337) with pedicel and flagellum together about 1.8 times head width, all funicle segments at least twice as long as broad and longest setae at least twice as long as diameter of segments; aedeagus about half as long as mid tibia.

HOSTS. The type series of *utetheisae* was recorded, perhaps erroneously, as having been reared from the eggs of *Utetheisa pulchella* (Lepidoptera: Arctiidae), but otherwise the species seems to be restricted to heteropterous eggs. In Africa, Prinsloo (1987) records the species from the eggs of *Anoplocnemis curvipes*, *Pseudotheraptus wayi*, *Clavigralla elongata*, *C. tomentosicollis* (Coreidae), *Mirperus jaculus* and *Riptortus dentipes* (Alydidae). Recorded below from the eggs of *Piezodorus hybneri*, *Leptocorisa* sp., *Leptocorisa acuta*, *Riptortus* sp. (Hemiptera: Alydididae), *Amblypelta lutescens papuensis*, *Dasynus piperis*, *Mictis profana* (Hemiptera: Coreidae), *Nezara viridula* (Hemiptera: Pentatomidae), an unidentified coreid bug and an unidentified moth.

USE IN BIOCONTROL. *O. utetheisae* is almost certainly the species introduced into Kenya and Tanzania as *Ooencyrtus* sp. for the control of *Pseudotheraptus wayi* (Hemiptera: Coreidae) (see Greathead, 1971). This may also have been the species introduced, under the name of *Ooencyrtus malayensis*, into the Solomon Islands in 1937–1938 for the control of *Amblypelta cocophaga* (Hemiptera: Coreidae) (Phillips, 1941) and the United States (Massachussets) in 1981 for the control of *Anasa tristis* (Hemiptera: Coreidae) and *Nezara viridula* (Hemiptera: Pentatomidae) (Coulson *et al.* 1988).

DISTRIBUTION. Sub-saharan Africa, India, Nepal, Thailand, P.R. China, Philippines, Malaysia, Indonesia, Papua New Guinea.

MATERIAL EXAMINED. Type material. Holotype ♀ of *Ooencyrtus patriciae* Subba Rao, NIGERIA: Kaduna State, Yankara, ex *Clavigralla tomentosicollis* (P.C. Matteson).

Non-type material. INDIA: 1♀, Uttar Pradesh, Dehra Dun, x.1979 (Z. Boucek); 1♀, Karnataka, Bangalore, 19–23.ix.1979 (J.S. Noyes); 4♀, Tamil Nadu, Coimbatore, 25.ix–1.x.1979 (J.S. Noyes); 2♀, Kerala, Walayar Forest, 26.xi–1.x.1979 (J.S. Noyes); 2♀, Periyar A. Sanc. 5–15.x.1979 (J.S. Noyes); 2♀, Assam, Tinsukia, on eggs of Hemiptera, IIE 21669, 12.viii.1990 (F. Alam); 5♀, Assam, Tinsukia, ex eggs of *Leptocorisa*, IIE 22252, 28.vii.1991 (Md. Farouk); 3♀, Assam, Tinsukia, 29.vii.1991 (Md. Farouk), 1♀, Assam, Tinsukia, IIE A20982, 16.vi.1989; 2♀, Assam, Tinsukia, ex eggs *Nezara viridula*, IIE 22252, 7.viii.1991 (Md. Farouk); 3♀, ?, C.I.E. A17567; NEPAL: 1♀, Kakani, 2070m, x.1983 (M.G. Allen); 2♀, Chitwan, Inner Terai, 150m, x.1983 (K.K. Gurung); 15♀, 2♂, Maharashtra, Dapoli, ex egg bug on snake gourd, CIE 19243, 1987; THAILAND: 1♀, Nan Pr. Nan, edge of rice paddy, BM 1986–78, 31.viii.1985 (M.J.E. Reacher-Huber); 2♀, Huai Kha Khaeng, ii.1986 (M.G. Allen); 1♀, Chang Kiang, Doi Suthop, ii.1985 (D. Jackson); 14♀, 6♂, Ratismoa Prov. Uthang Dist., ex eggs of *Piezodorus hybneri* & *Nezara viridula*, 19–20.viii.1989 (M. Kogan) [identified as *Ooencyrtus malayensis* Ferriere by B.R. Subba Rao]; P.R. CHINA: 4♀, Canton (Guangdong), ex eggs of a coreid bug (R.B. Falkenstein); 1♀, Hainan, Dang Xiang, 7.v.1983 (Z. Boucek); PHILIPPINES: 24♀, 15♂, Laguna, Los Banos, 150 ft. ex *Leptocorisa*, v.1930 (L.B. Uichanco); MALAYSIA: Setapak, 5♀, 2♂, ex eggs of *Leptocorisa* sp., 17.xii.1922 (G.H. Corbett & B.A.R. Gater) [syntypes of *Ooencyrtus malayensis*]; 1♀, Sumger Lua, ex eggs of *Leptocorisa acuta* Thunberg, 20.xi.1928 (G.H. Corbett) [syntype of *Ooencyrtus malayensis*]; 1♀, Genting Highlands, vii.1981 (R.I. Vane Wright); 4♀, Sarawak, 4th div. Gn. Mulu., RGS Exp. 17.ix–23.x.1977 (D. Hollis); 3♀, Sarawak, Long Lama, 13.ii.1987 (A.T. Finamore & C. Boxfield); 1♀, Sabah, Kinabalu NP, Poring Hot Springs, 12.v.1987 (A. Smetana); 1♀, Sabah, Kinabalu NP, Poring Hot Springs, 900m, 14.v.1987 (A. Smetana); 1♀, Sabah, Kinabalu NP, Poring Hot Springs, 500m, 30.viii.1988 (A. Smetana); 2♀, Sabah, Danum Valley, xi.1986 (P. Eggleton); INDONESIA, 6♀, Banka Is. ex *Dasynus piperis* China, 1930 (J.van der Vecht); 3♀, 2♂, Sumatra, Pematang Siantar, ex eggs of a moth, 30.ix.1931 (R.I. Nel); 1♀, Java, Bogor, viii.1983 (Hull Univ. Exp.); 4♀, Java, Krakatau, various localities and dates ix.1984 (S.G. Compton); 2♀, Sulawesi Tengah, Nr. Morowali, Ranu River Area, Lowland rain forest, iii.1980 (M.J.D. Brendell); 92♀, Sulawesi, Utara, Dumoga-Bone NP, Toraut, iv.1985 (J.S. Noyes); PAPUA NEW GUINEA: 6♀, Morobe Prov. Markham Valley, ex eggs of *Riptortus* sp., CIE A12822, 23.xii.1980 (G Youma); 1♀, Areme, Musgrave R. 9.xii.1982 (Z. Boucek); 1♀, Mt. Hagen, 1600m, 17.xii.1982 (Z. Boucek); 10♀, 3♂, Laloki Res. St. ex eggs of *Amblypelta lutescens papuensis*, 24.viii.1989 (F.M. Dori). Material in BMNH, ZISP, QMB, MZB, PPRI, CNC, USNM.

Extralimital material. SENEGAL: 3♀, Bambey, ex eggs of coreid, 21.x.1943 (J. Risbec); P.R.BENIN: 4♀, 5♂, Cotonou, ex egg of *Clavigralla shadabi*, 1992 (H. Dreyer); 1♀, 1♂, Cotonou, ex egg *Riptortus dentipes* 1992 (H. Dreyer); NIGERIA: 2♀, 1♂, Ibadan, ex eggs *Anoplocnemis curvipes*, CIE A8523, 1975 (Ochiah); MALAWI: 5♀, rec'd 10.xii.1992, Lab reared ex eggs of *Bathycoelia bequarti*, Rec'd from D.A. Ironside /93–001, IIE 22730; TANZANIA: 3♀, 6♂, Zanzibar, ex eggs of *Pseudotheraptus wayi*, 1959, CIE Coll. 16944 (B.H. Hyde-Wyatt). Material in BMNH.

COMMENTS. Prinsloo (1987) treated *Aenasioidea demodoci* both as a synonym of *utetheisae* (his page 9) and as a valid species (his page 15). This cannot be resolved until a lectotype is designated for *demodoci*. Clearly it would be better to designate the lectotype from the series belonging to the valid species as interpreted by Prinsloo on page 15 of his paper and therefore we are not including the name here as a synonym of *utetheisae*.

This species can be confused easily with *papilionis* as demonstrated by the inclusion of several specimens of *utetheisae* in the syntypic series of *malayensis* by Ferrière. Females of *utetheisae* can be separated relaibaly from *papilionis* by the dark brown ovipositor sheaths whereas in *papilionis* the sheaths are yellow or orange. Otherwise the flagellar segments of *utetheisae* are relatively longer and the structure of the ovipositor and hypopygium is slightly different (compare Figs 317–319 with 329 and 331, Figs 324–326 with 336).

EXCLUDED SPECIES

Ooencyrtus johnsoni (Howard)

Encyrtus johnsoni Howard, 1898: 18. Syntypes ♀♂, USA (USNM, not examined.
Ooencyrtus johnsoni (Howard); Ashmead, 1900: 382.

COMMENTS. This species was introduced into Hawaii in 1940 for the control of *Murgantia histrionica* (Hemiptera: Pentatomidae). Although Fullaway (1947) reported that the species was well established in 1946 it has not been reported in Hawaii since then (Beardsley, 1976). We have not seen any specimens of this species from Hawaii and therefore it is not included here in the treatment of species.

Ooencyrtus trinidadensis Crawford

Ooencyrtus trinidadensis Crawford, 1913: 347. Lectotype ♀, Trinidad (USNM, not examined).

COMMENTS. Introduced into Hawaii in 1962 for the control of *Nezara viridula* (Hemiptera: Pentatomidae) but apparently did not become established (Davis, 1964; Waterhouse & Norris, 1987).

The species is very close to, and may be synonymous with, *Ooencyrtus johnsoni* (Howard).

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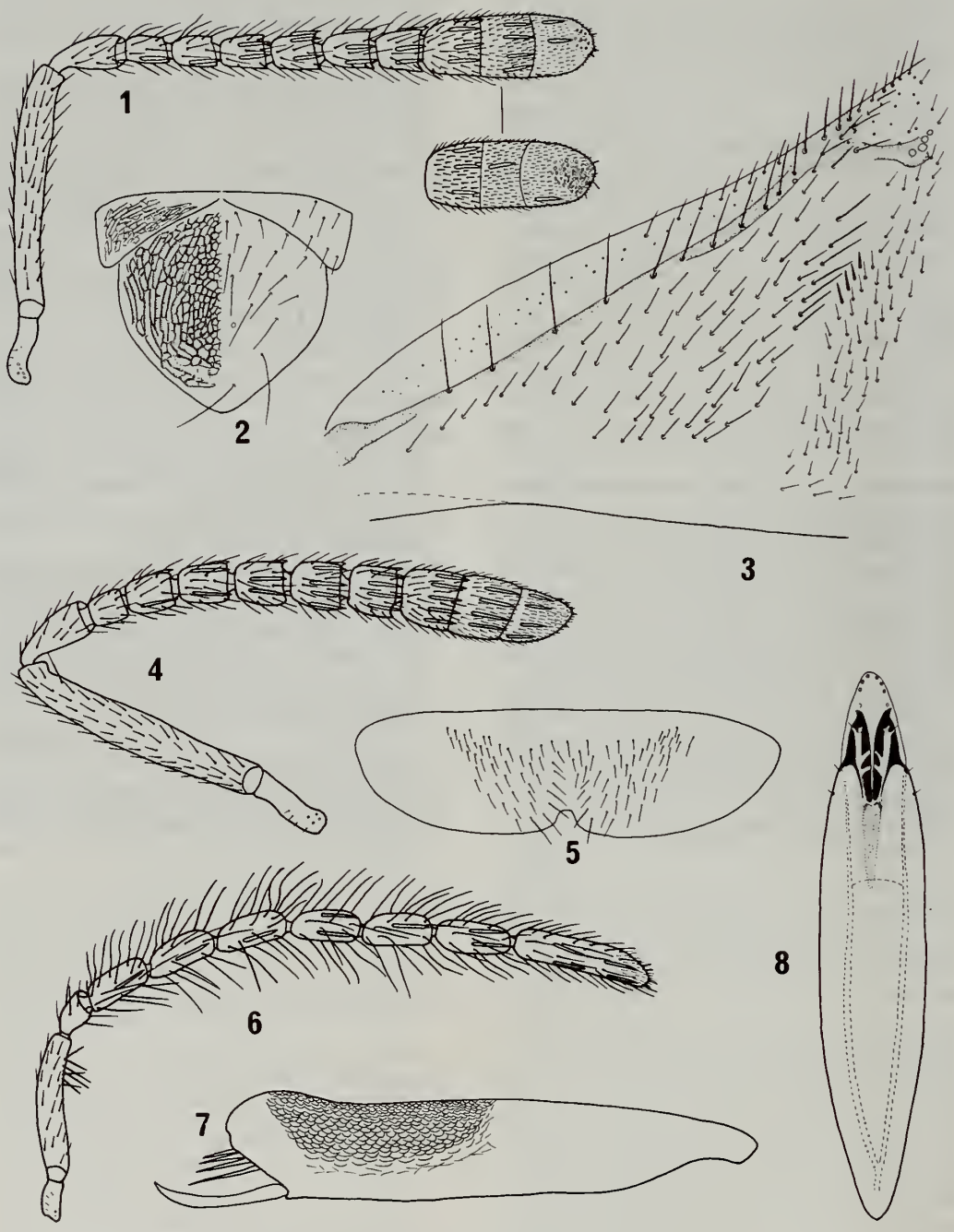
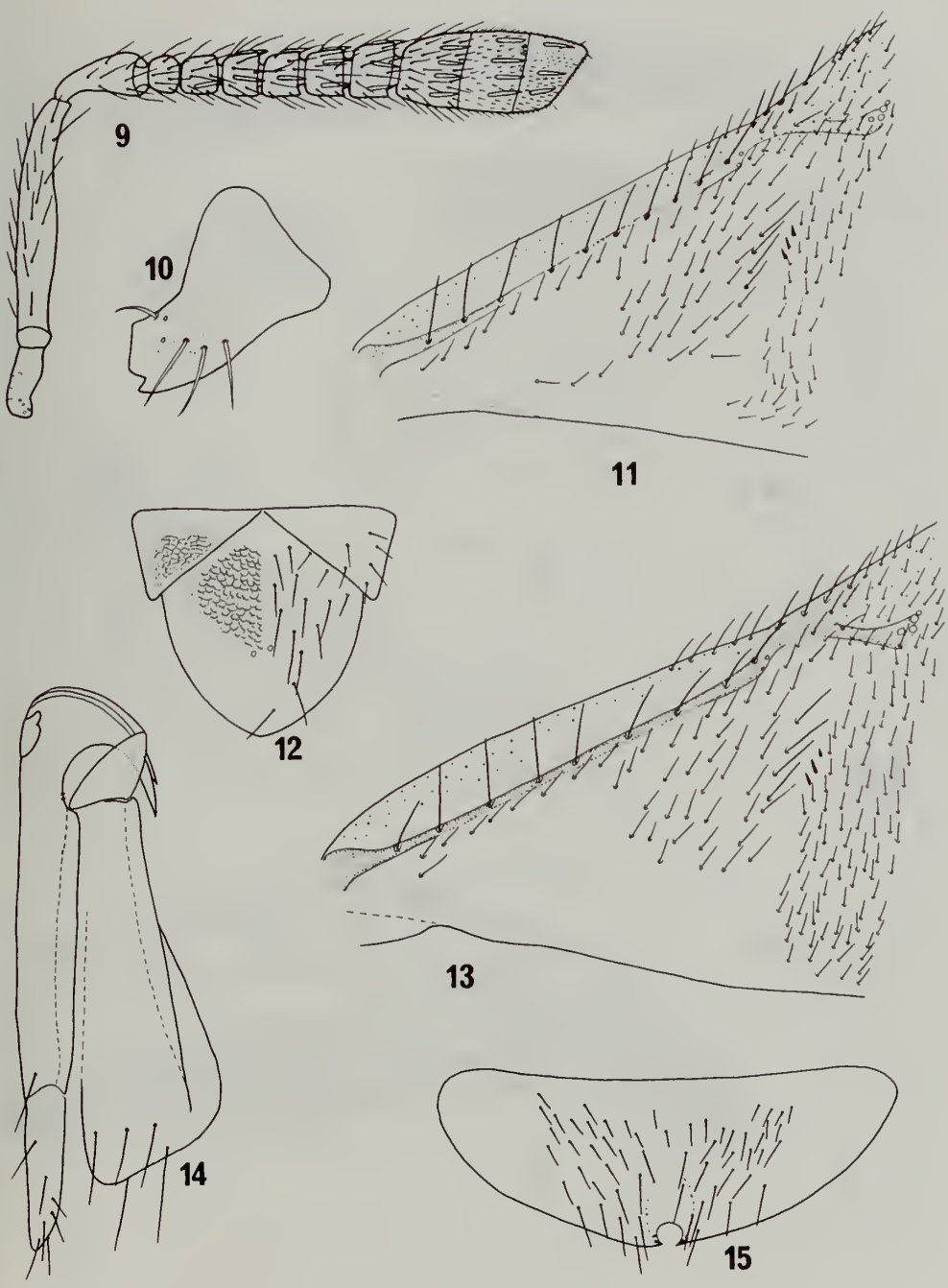
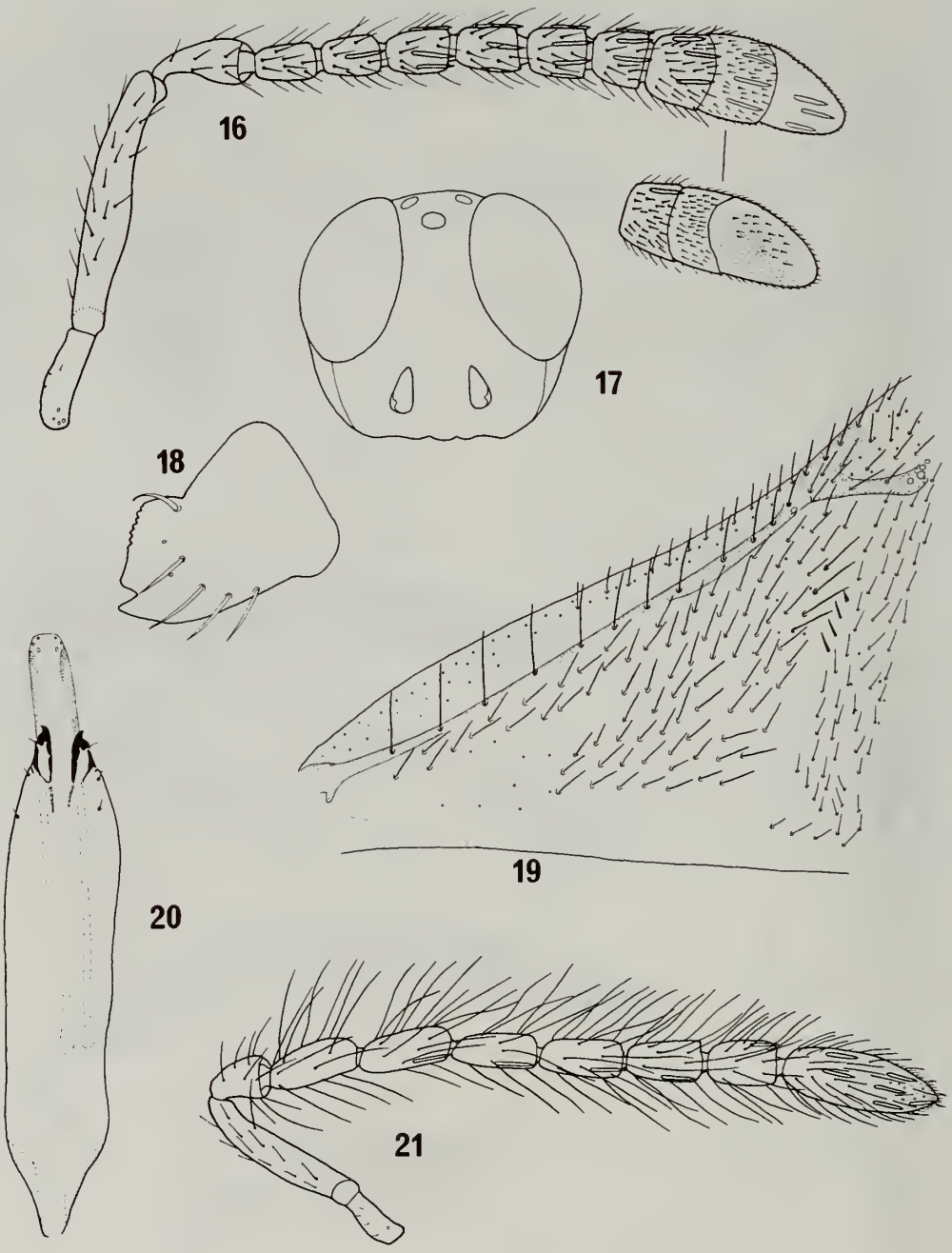


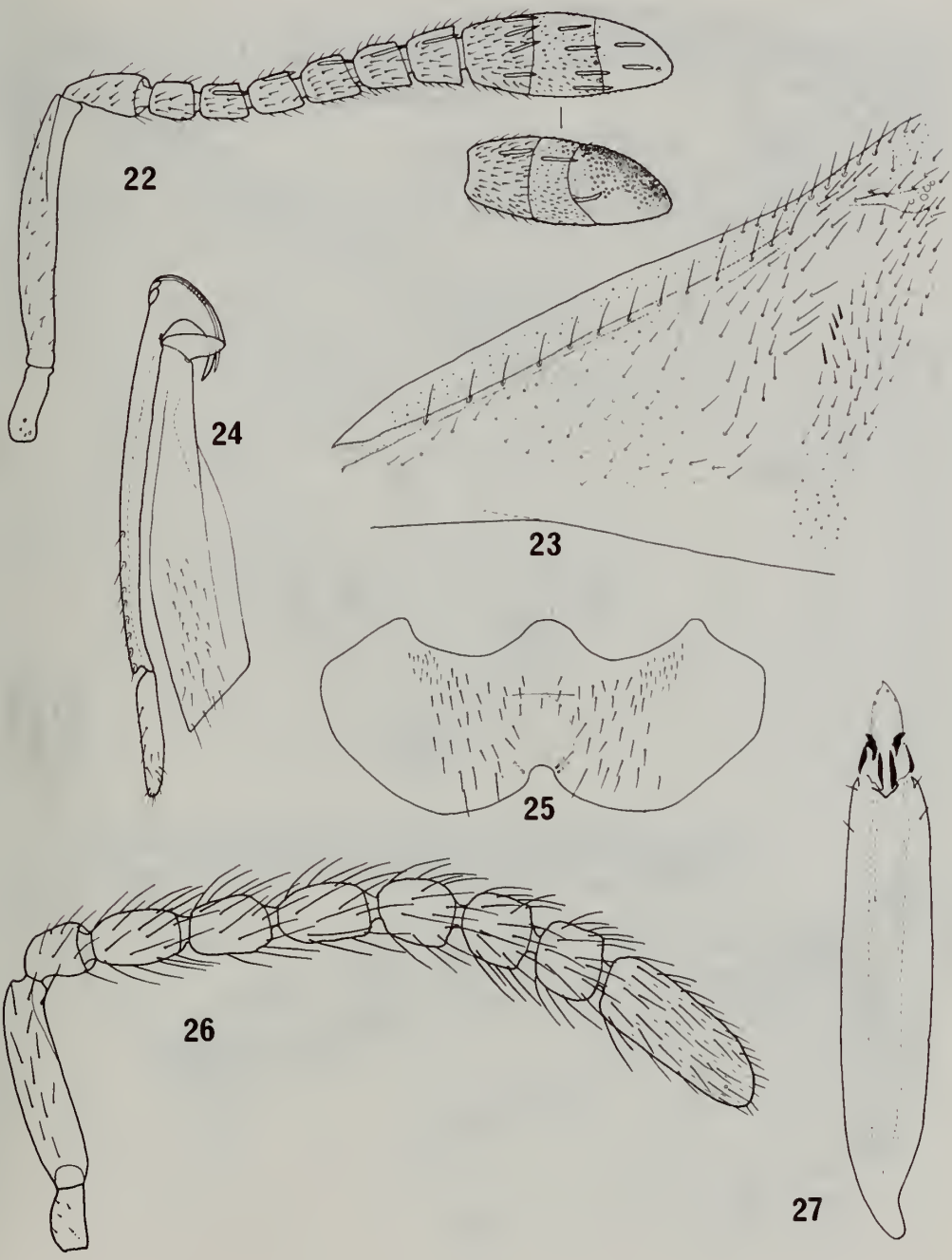
Figs 1–8 *O. guamensis* – 1, antenna including reverse side of clava, ♀; 2, scutellum, ♀; 3, right forewing, upper aspect, ♀; 4, antenna with clava in side aspect showing oblique truncation, ♀; 5, hypopygium; 6, antenna, ♂; 7, foretibia showing inner, apical scaly area, ♂; 8, genitalia ♂.



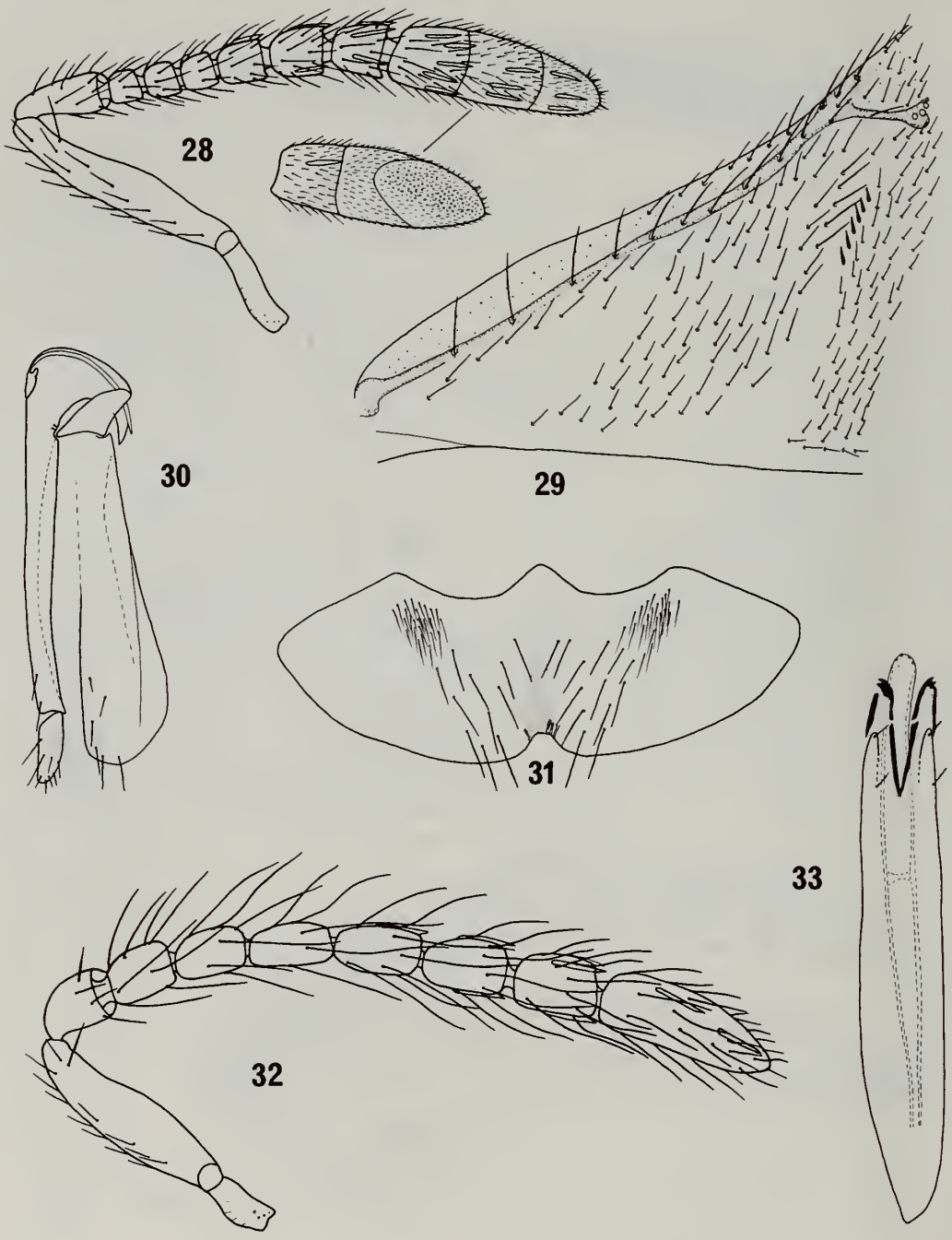
Figs 9–15 *O. acca* – 9, antenna, ♀; 10, left mandible; 11, right forewing, upper surface, ♀; 12, scutellum, ♀; 13, right forewing, upper surface, ♀; 14, ovipositor; 15, hypopygium.



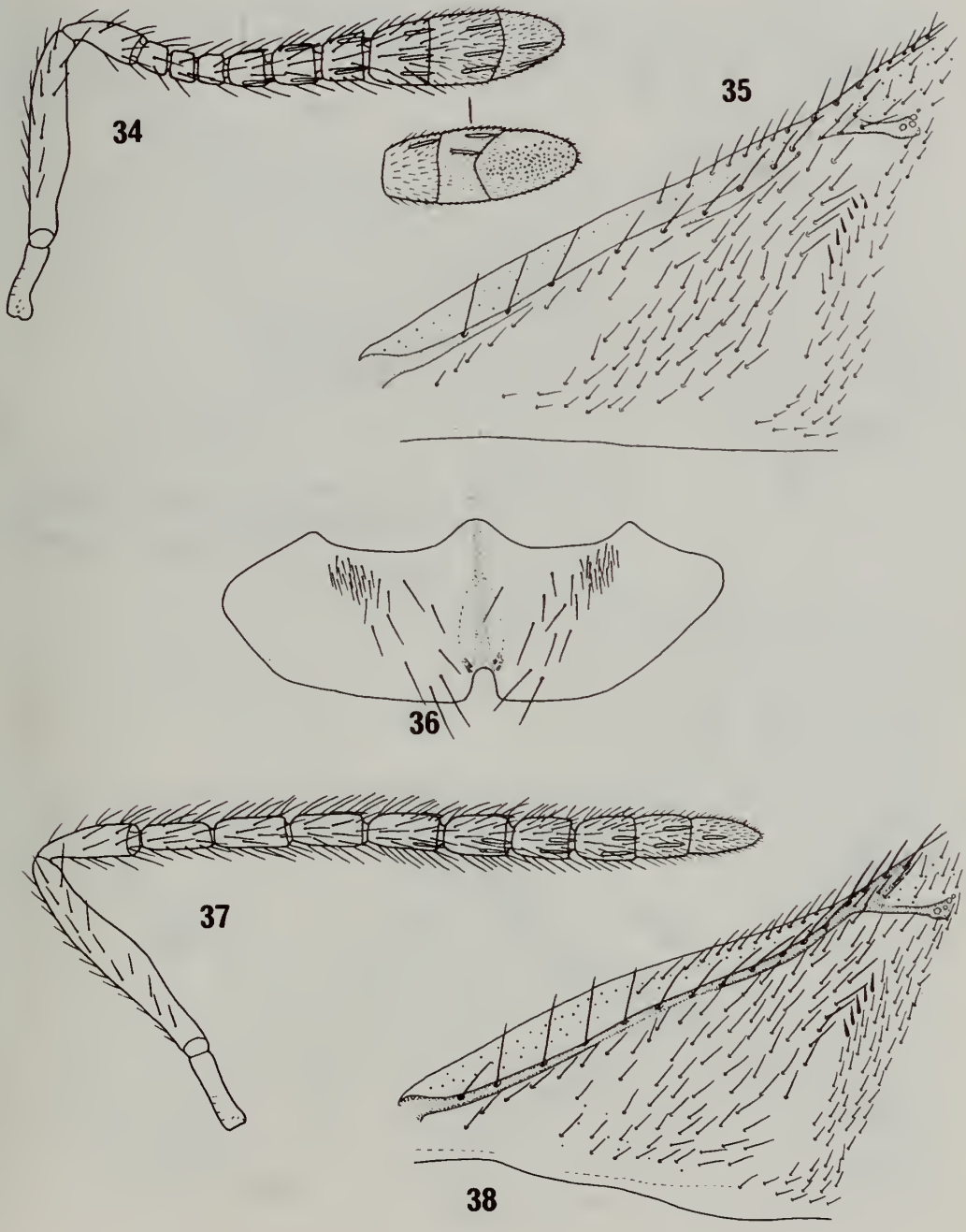
Figs 16–21 *O. phongi* – 16, right antenna, outer aspect including reverse side of clava, ♀; 17, head, facial view, ♀; 18, left mandible, ♀; 19, right forewing, upper surface, ♀; 20, genitalia, ♂; 21, antenna, ♂.



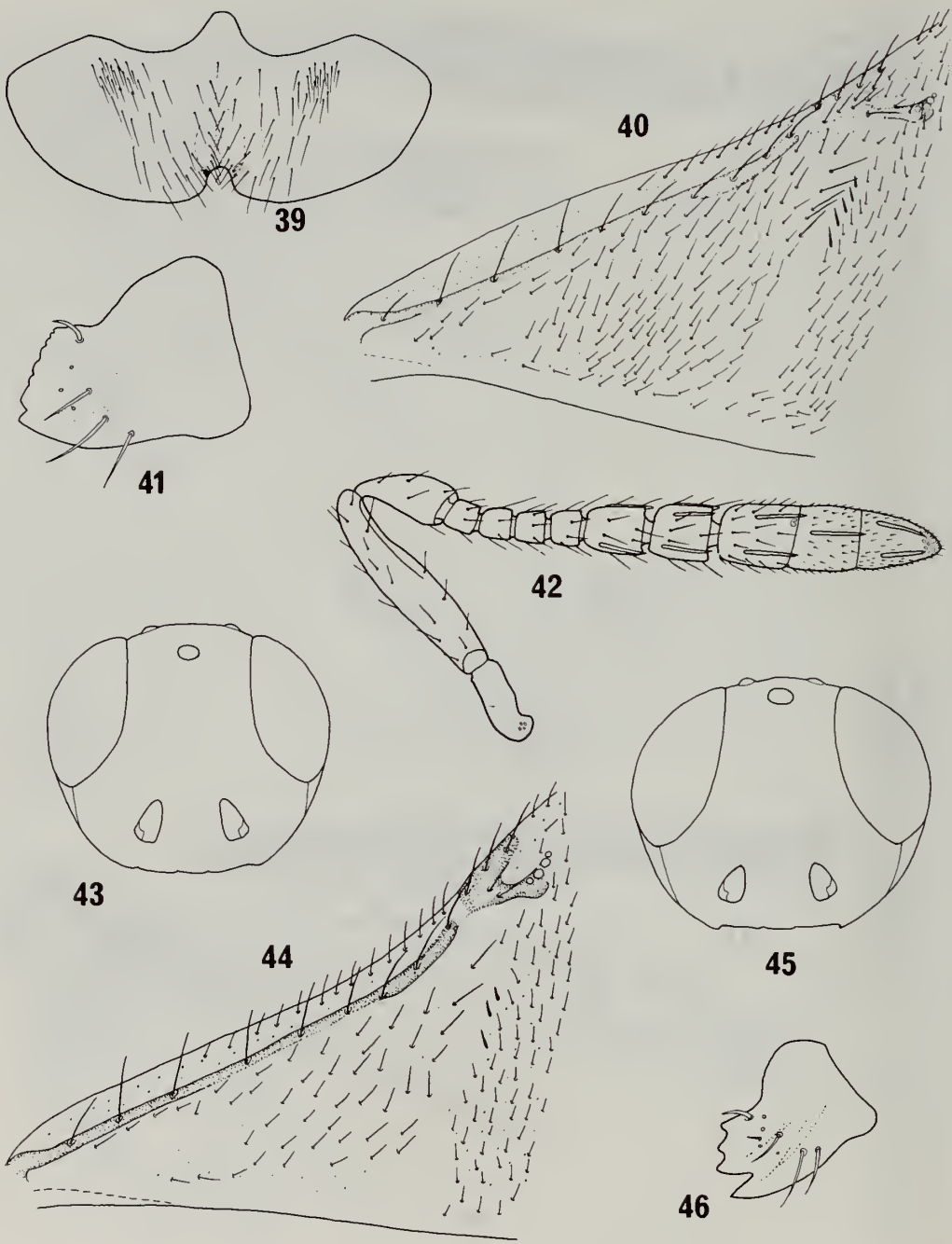
Figs 22–27 *O. acus* – 22, antenna including reverse side of clava, ♀; 23, right forewing, upper surface, ♀; 24, ovipositor; 25, hypopygium; 26, antenna, ♂; 27, genitalia, ♂.



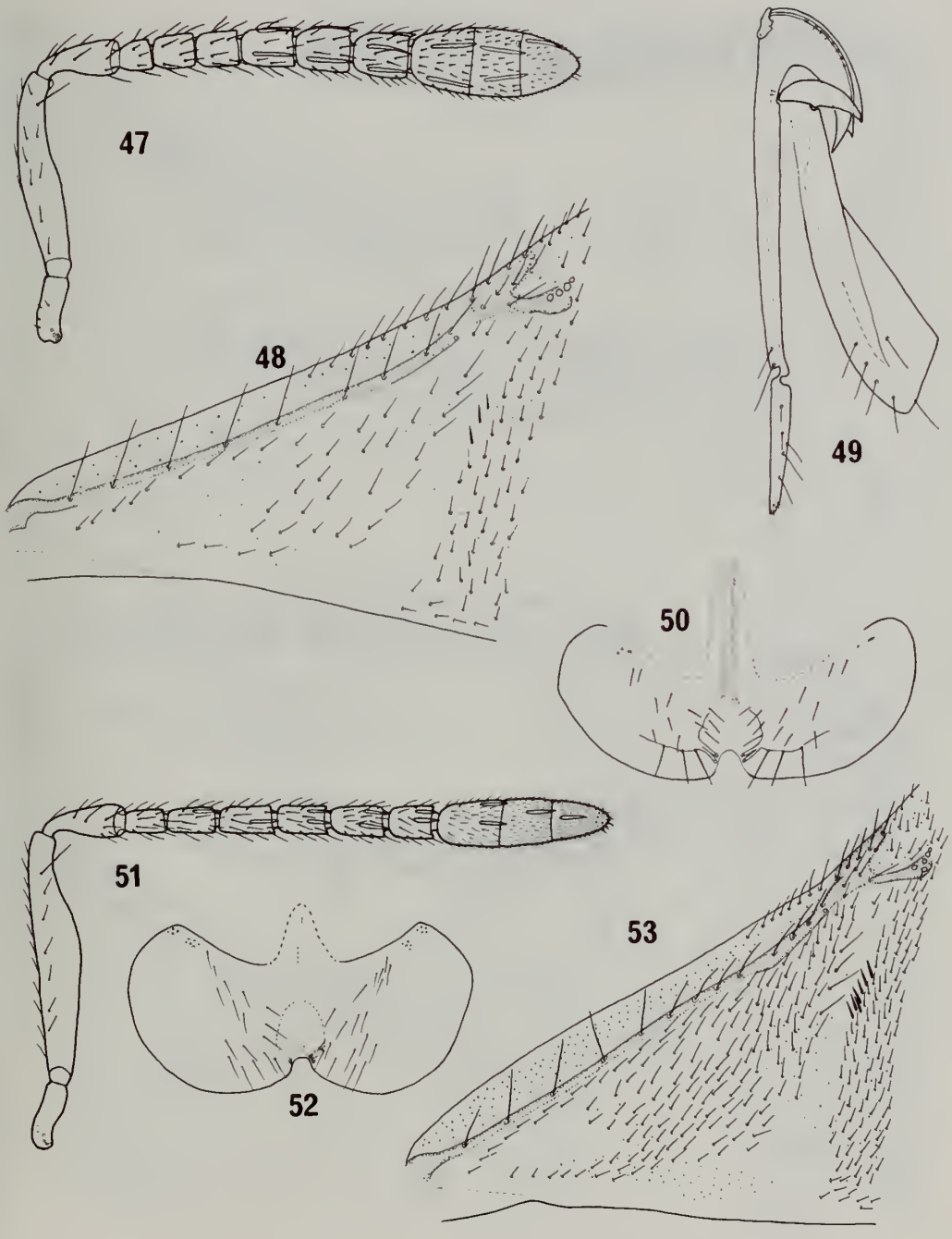
Figs 28–33 *O. caurus* – 28, antenna including reverse side of clava, ♀; 29, right forewing, upper surface, ♀; 30, ovipositor; 31, hypopygium; 32, antenna, ♂; 33, genitalia, ♂.



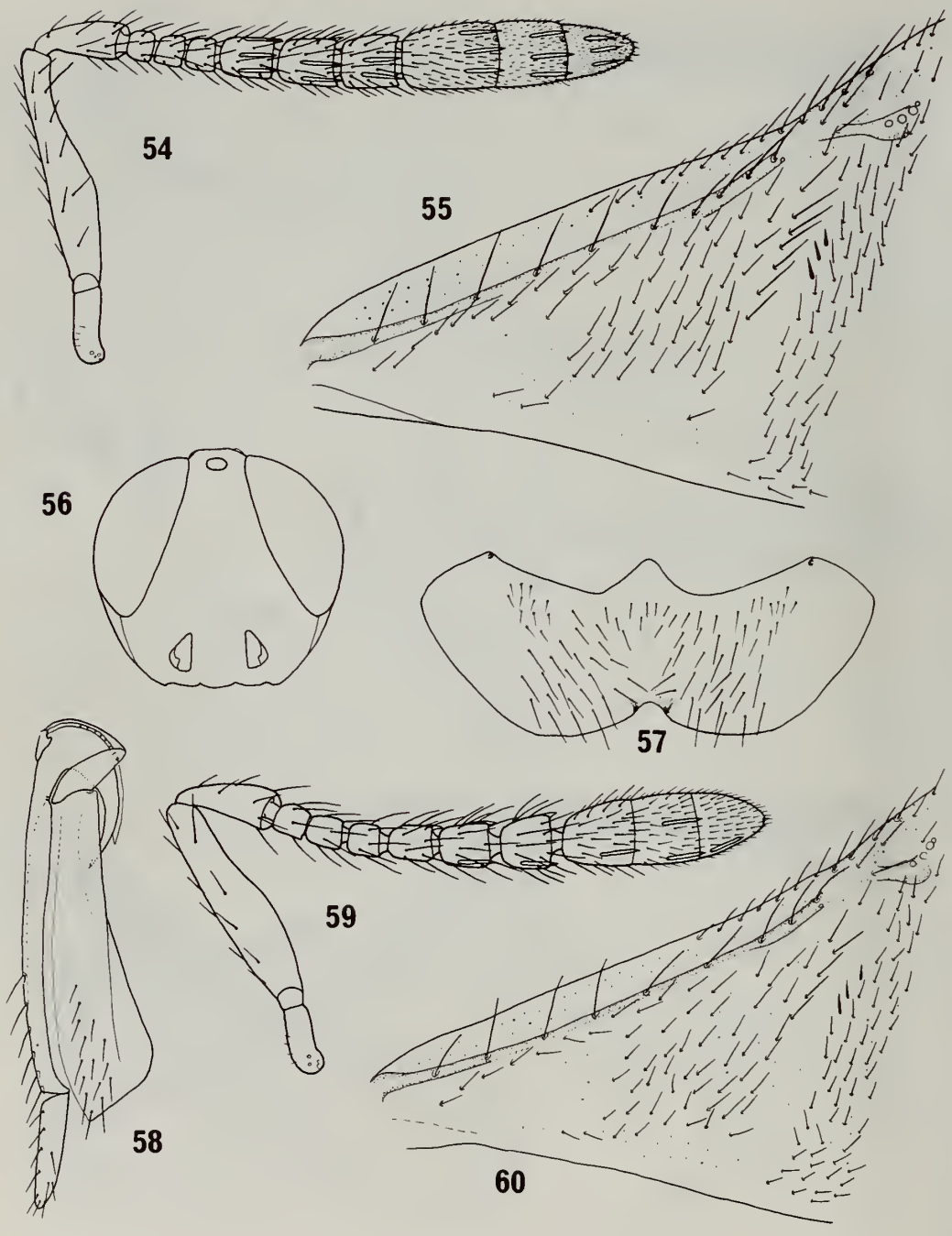
Figs 34–38 *O. lucens* – 34, antenna including reverse side of clava,; ♀; 35, right forewing, upper surface, ♀; 36, hypopygium; *O. minerva* – 37, antenna, ♀; 38, right forewing, upper surface, ♀.



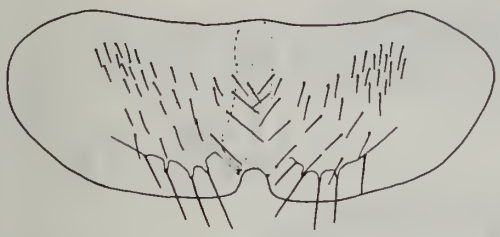
Figs 39–46 *O. icarus* – 39, hypopygium; 40, right forewing, upper surface, ♀; 41, left mandible. *O. adonis* – 42, antenna, ♀; 43, head, facial aspect, ♀; 44, right forewing, upper surface, ♀. *O. aeneas* – 45, head, facial aspect, ♀; 46, left mandible.

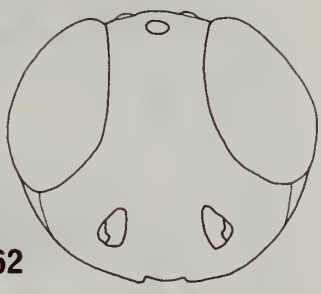


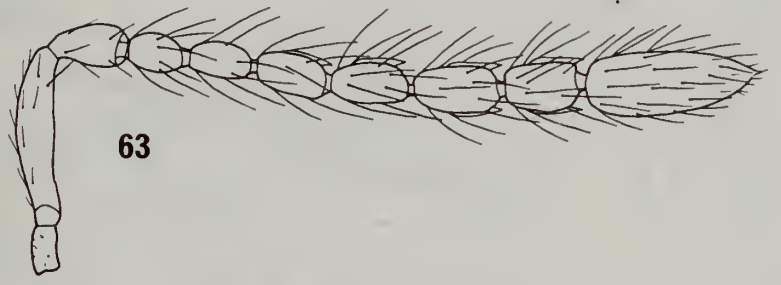
Figs 47–53 *O. aeneas* – 47, antenna, ♀; 48, right forewing, upper surface, ♀; 49, ovipositor; 50, hypopygium. *O. kuvanae* – 51, antenna, ♀; 52, hypopygium; 53, right forewing, upper surface, ♀.

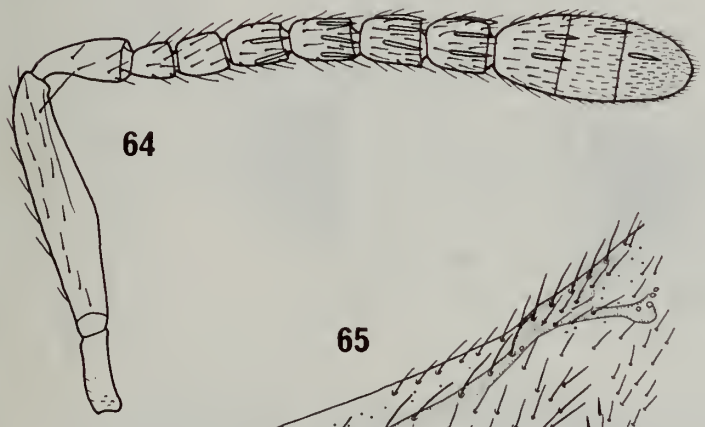


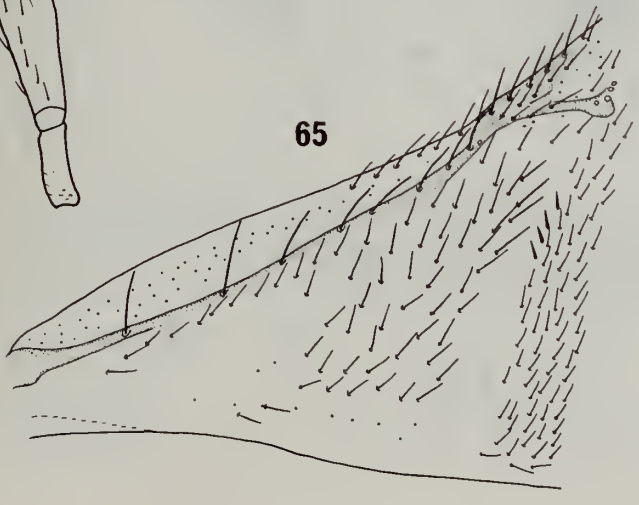
Figs 54–60 *O. dis* – 54, antenna, ♀; 55, right forewing, upper surface, ♀; 56, head, facial aspect, ♀; 57, hypopygium; 58, ovipositor. *O. hercle* – 59, antenna, ♀; 60, right forewing, upper surface, ♀.



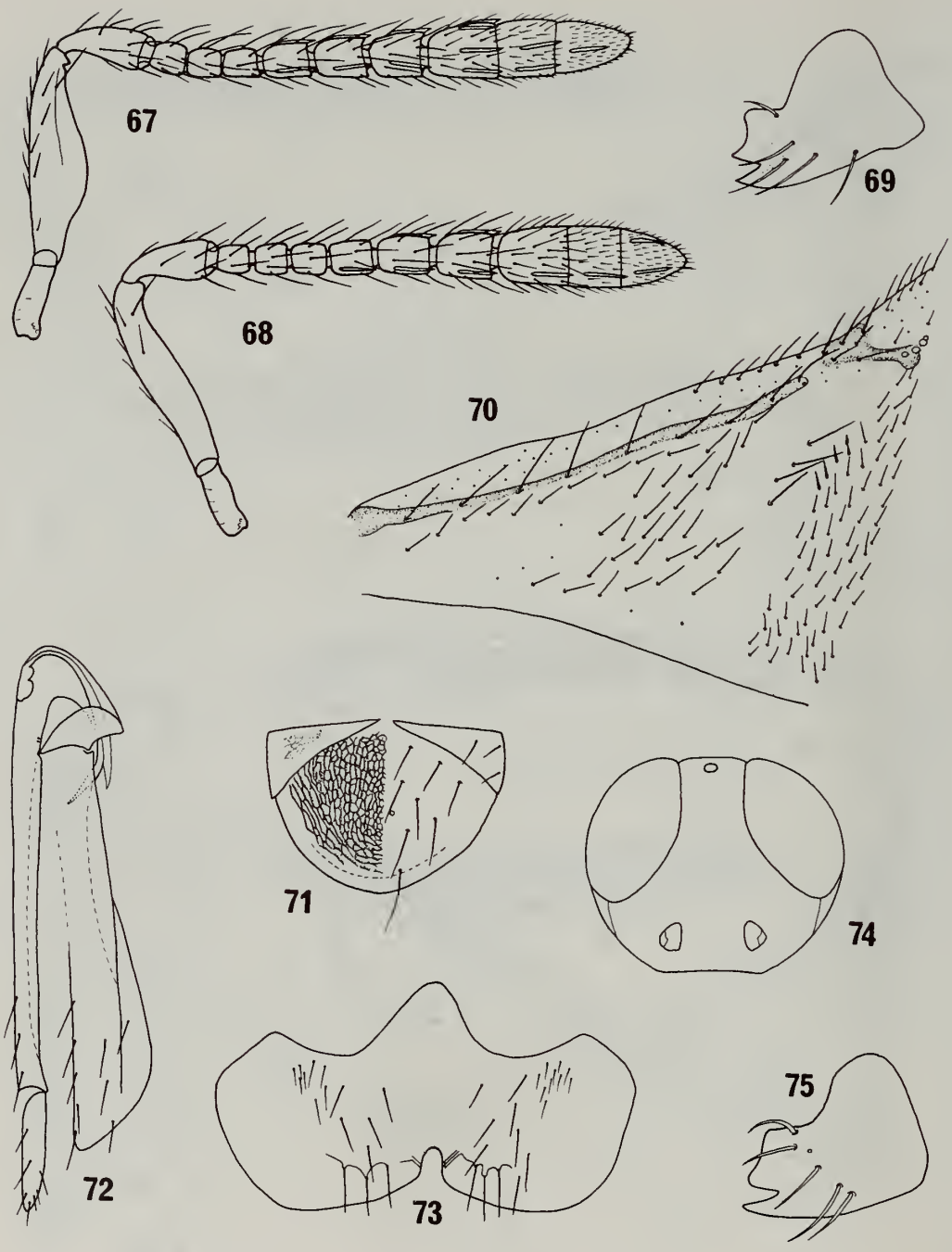




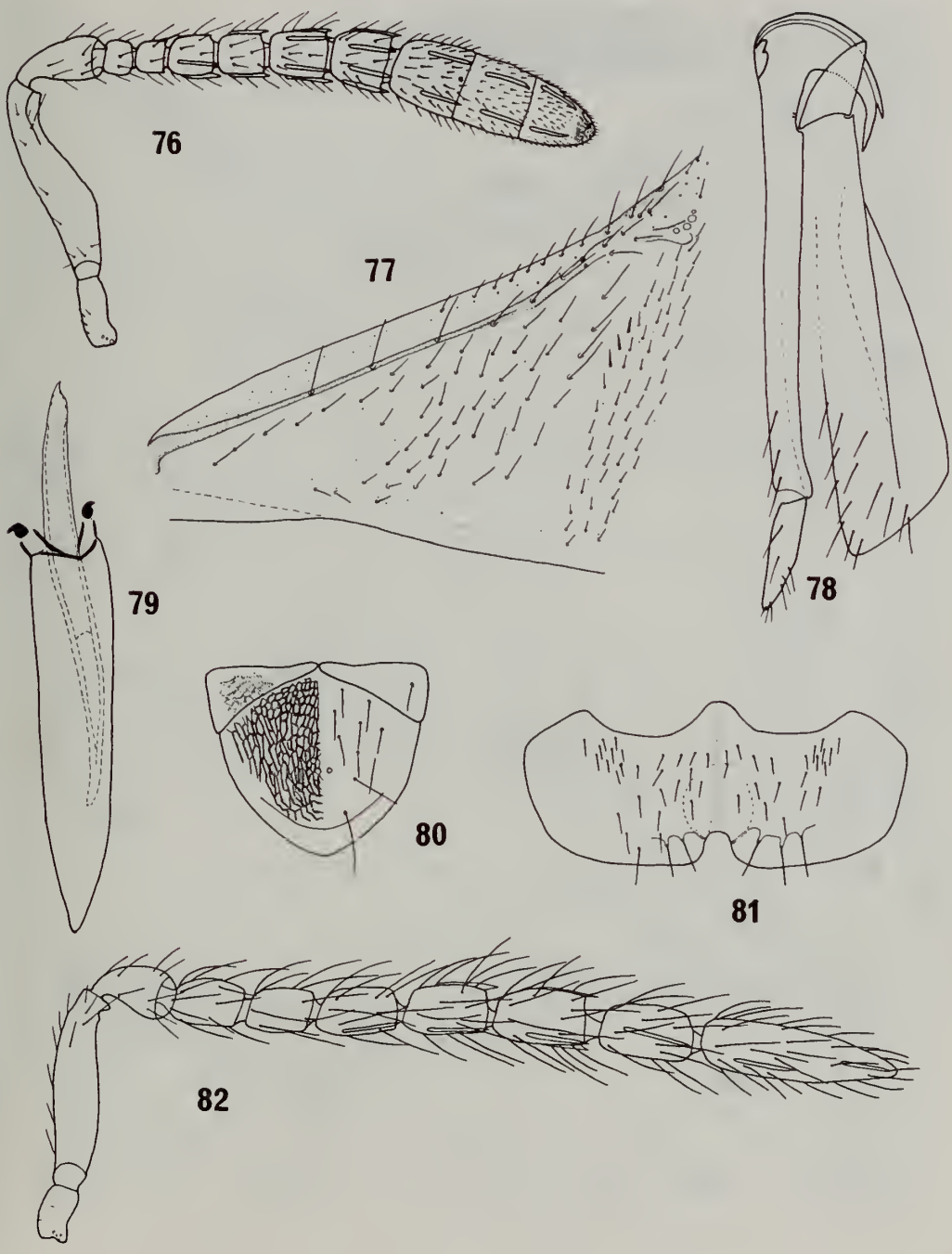




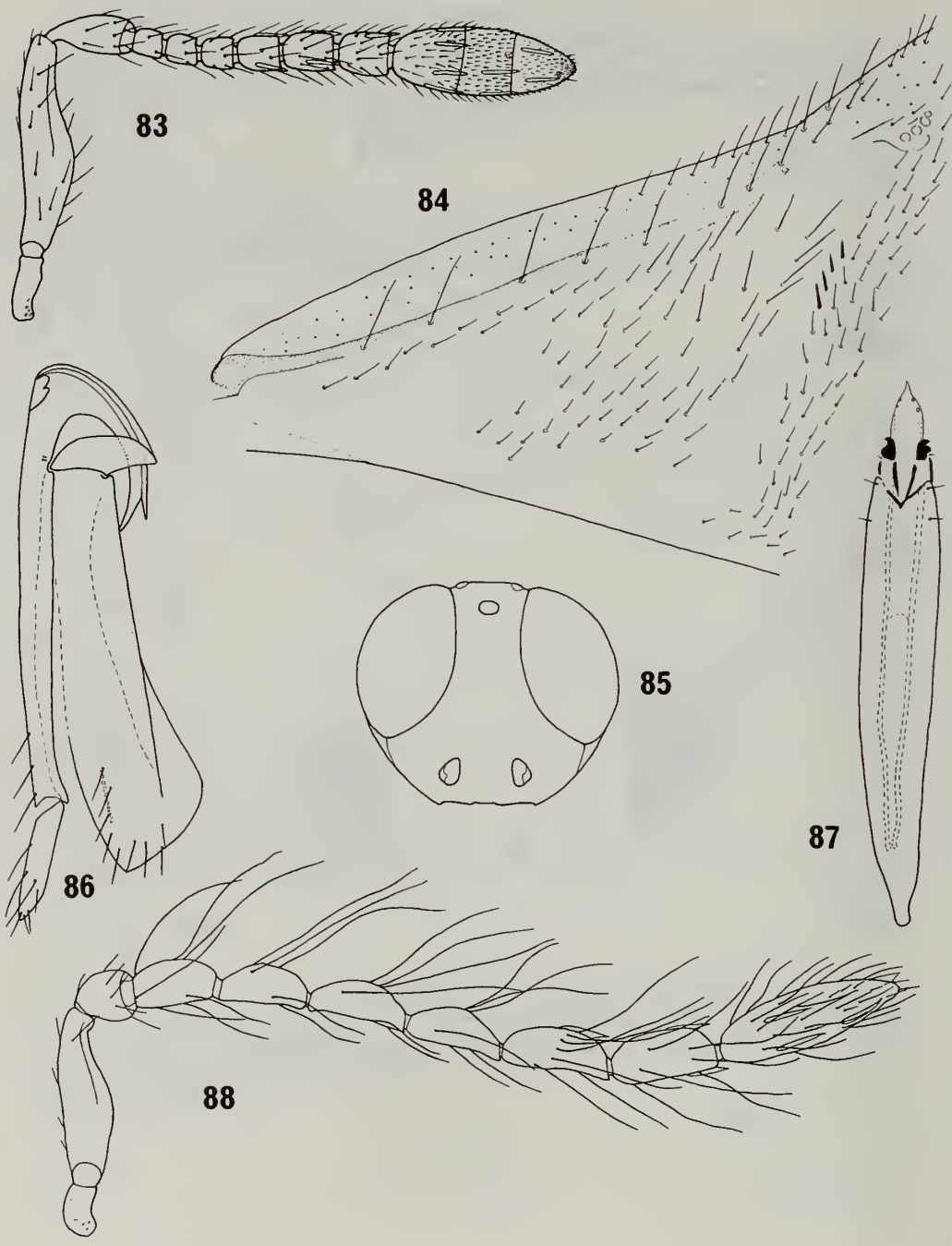
Figs 61–66 *O. hercle* – 61, hypopygium; 62, head, facial aspect, ♀; 63, antenna, ♂. *O. corbetti* – 64, antenna clava slightly collapsed, ♀; 65, right forewing, upper surface, ♀; 66, ovipositor.



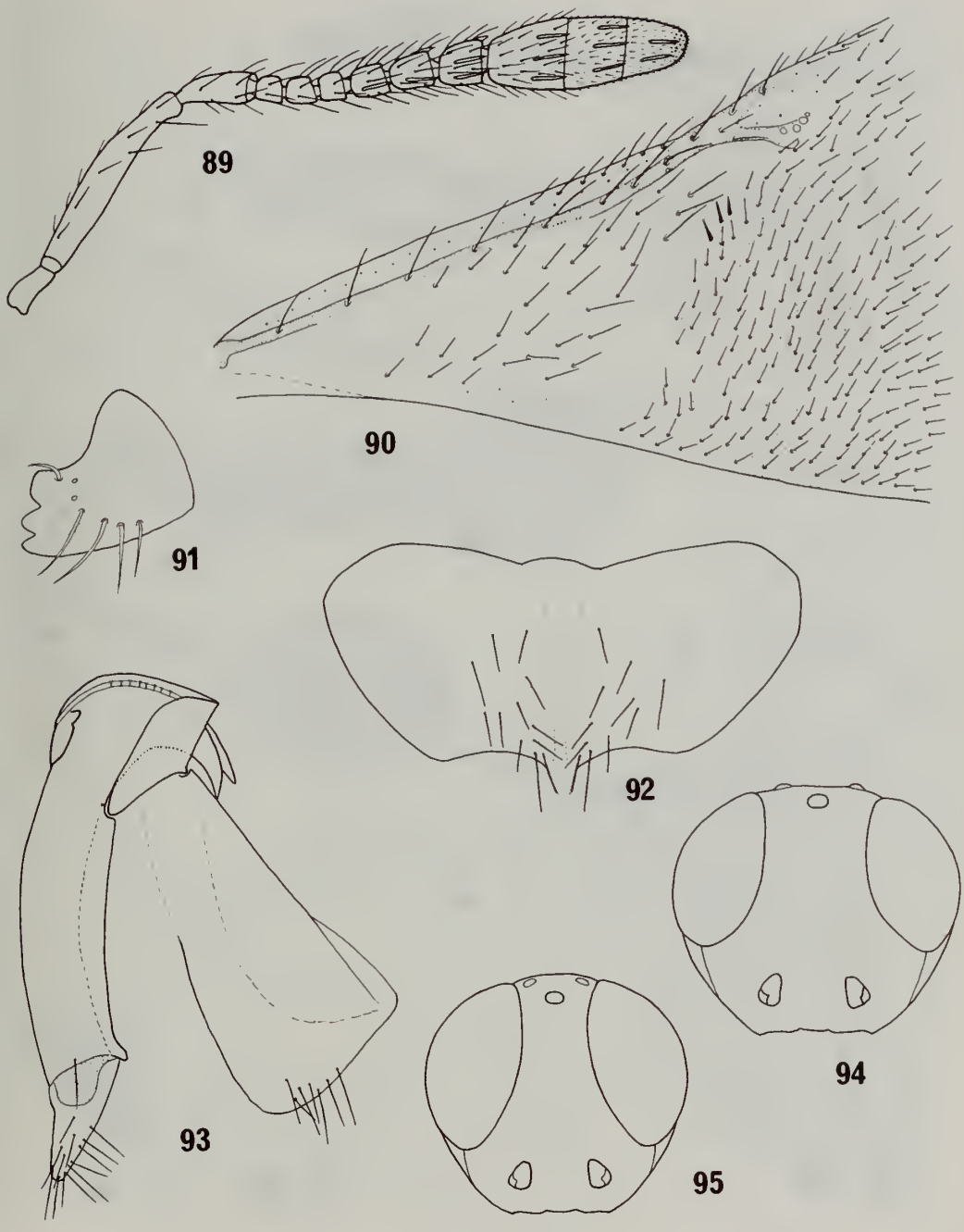
Figs 67–75 *O. podontiae* – 67, antenna, ♀ paralectotype,; 68, antenna, ♀ non-type,; 69, left mandible, ♀; 70, right forewing, upper surface, ♀; 71, scutellum, ♀; 72, ovipositor; 73, hypopygium. *O. pindarus* – 74, head, facial aspect, ♀; 75, left mandible.



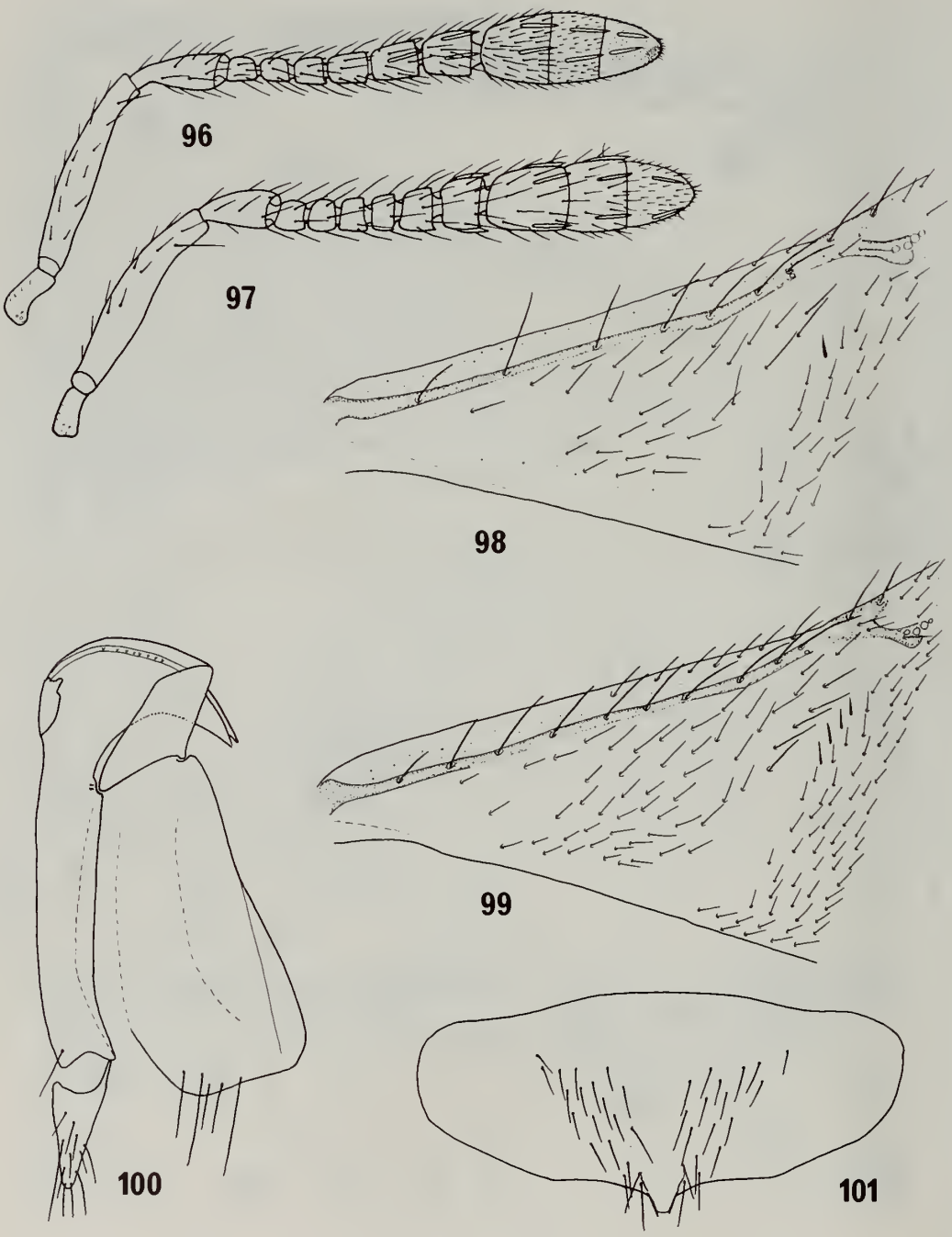
Figs 76–82 *O. pindarus* – 76, antenna, ♀; 77, right forewing, upper surface; ♀; 78, ovipositor; 79, genitalia, ♂; 80, scutellum, ♀; 81, hypopygium; 82, right antennae, outer aspect, ♂.



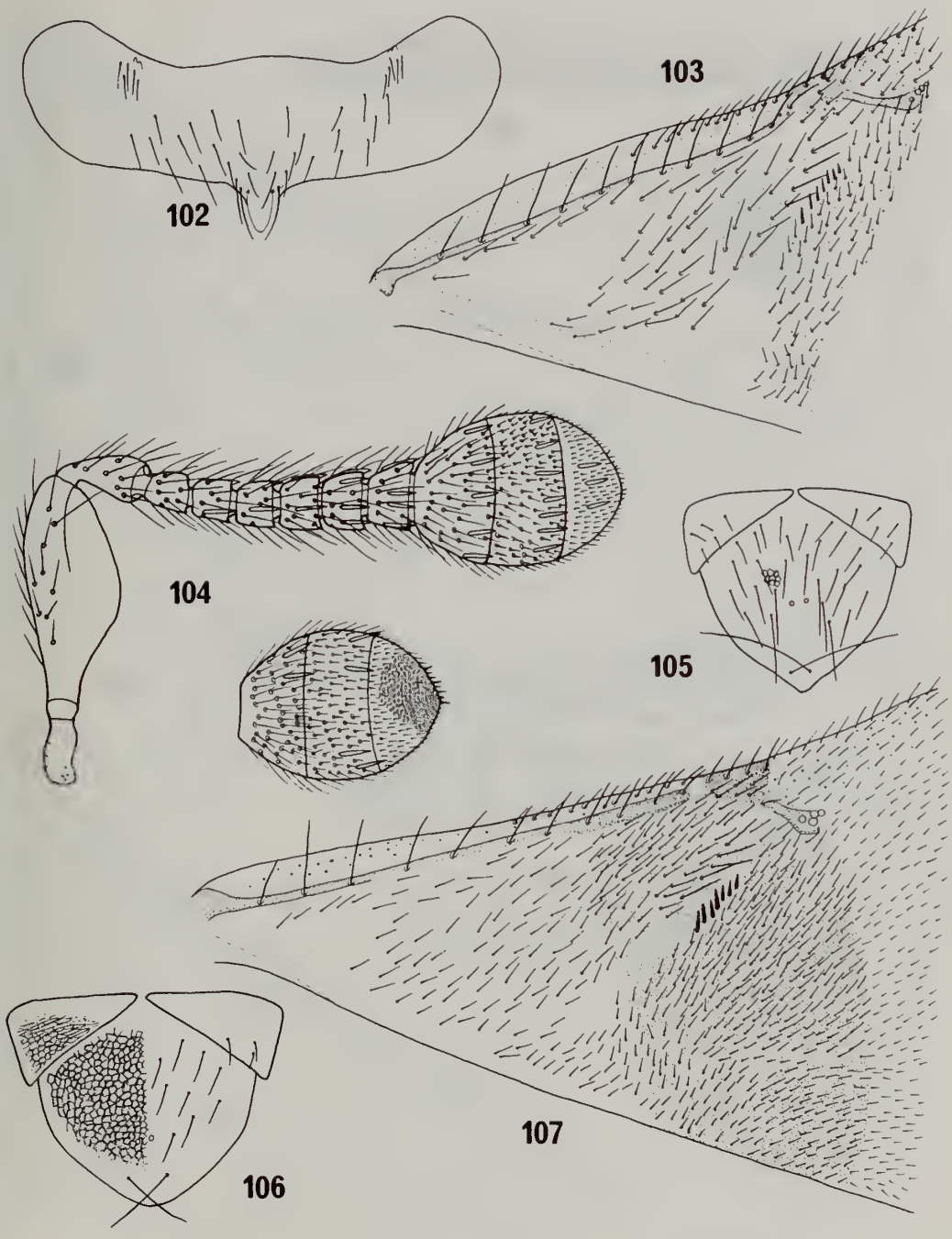
Figs 83–88 *O. plautus* – 83, antenna, ♀; 84, right forewing base, upper surface, ♀; 85, head, facial aspect, ♀; 86, ovipositor; 87, genitalia, ♂; 88, antenna, ♂.



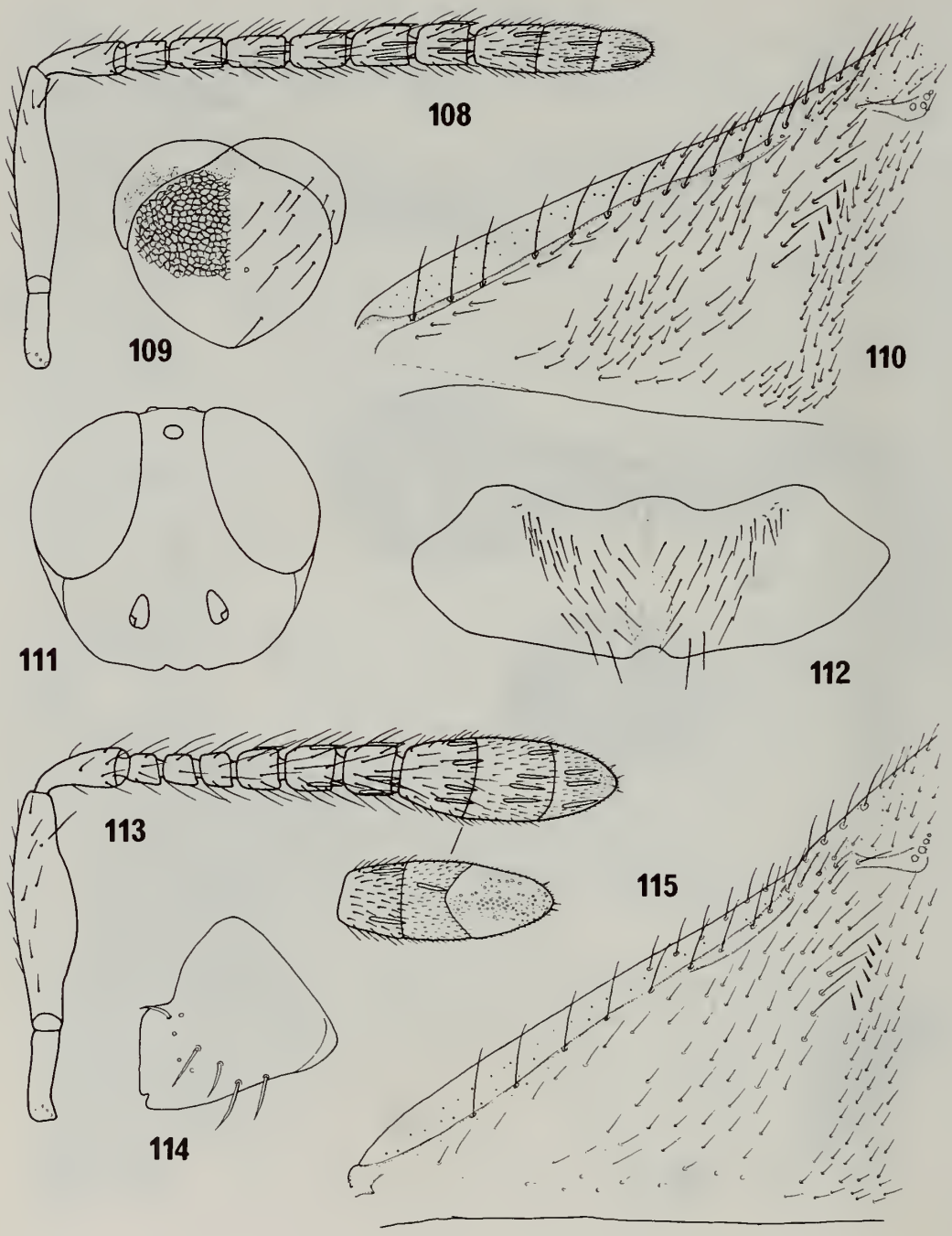
Figs 89–95 *O. daphne* – 89, antenna, ♀; 90, right forewing base, upper surface, ♀; 91, left mandible; 92, hypopygium; 93, ovipositor, ♀. *O. flavipes* – 94, 95, head, facial aspect, ♀.



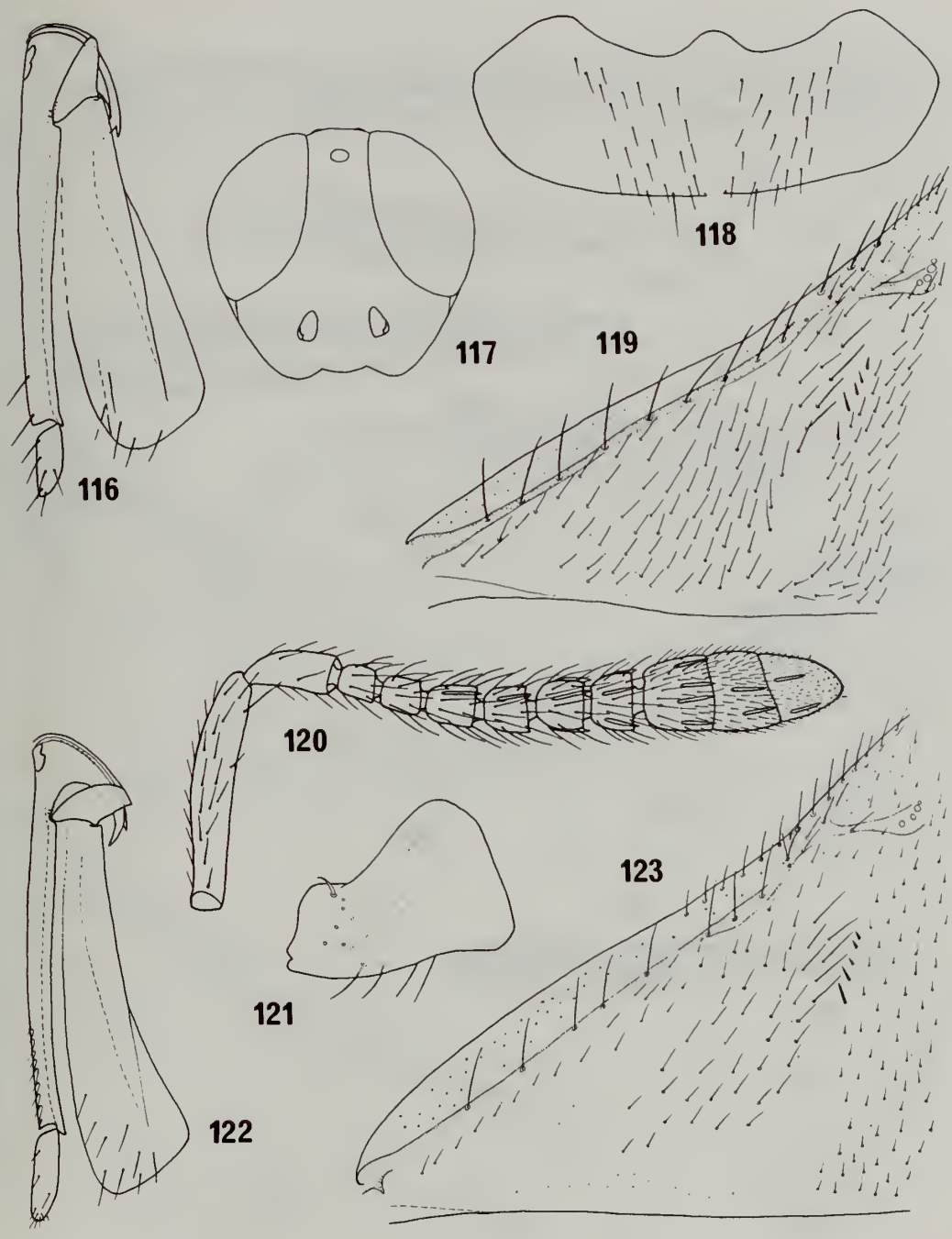
Figs 96–101 *O. flavipes* – 96, 97, antenna, ♀; 98, 99, right forewing base, upper surface, ♀; 100, ovipositor; 101, hypopygium.



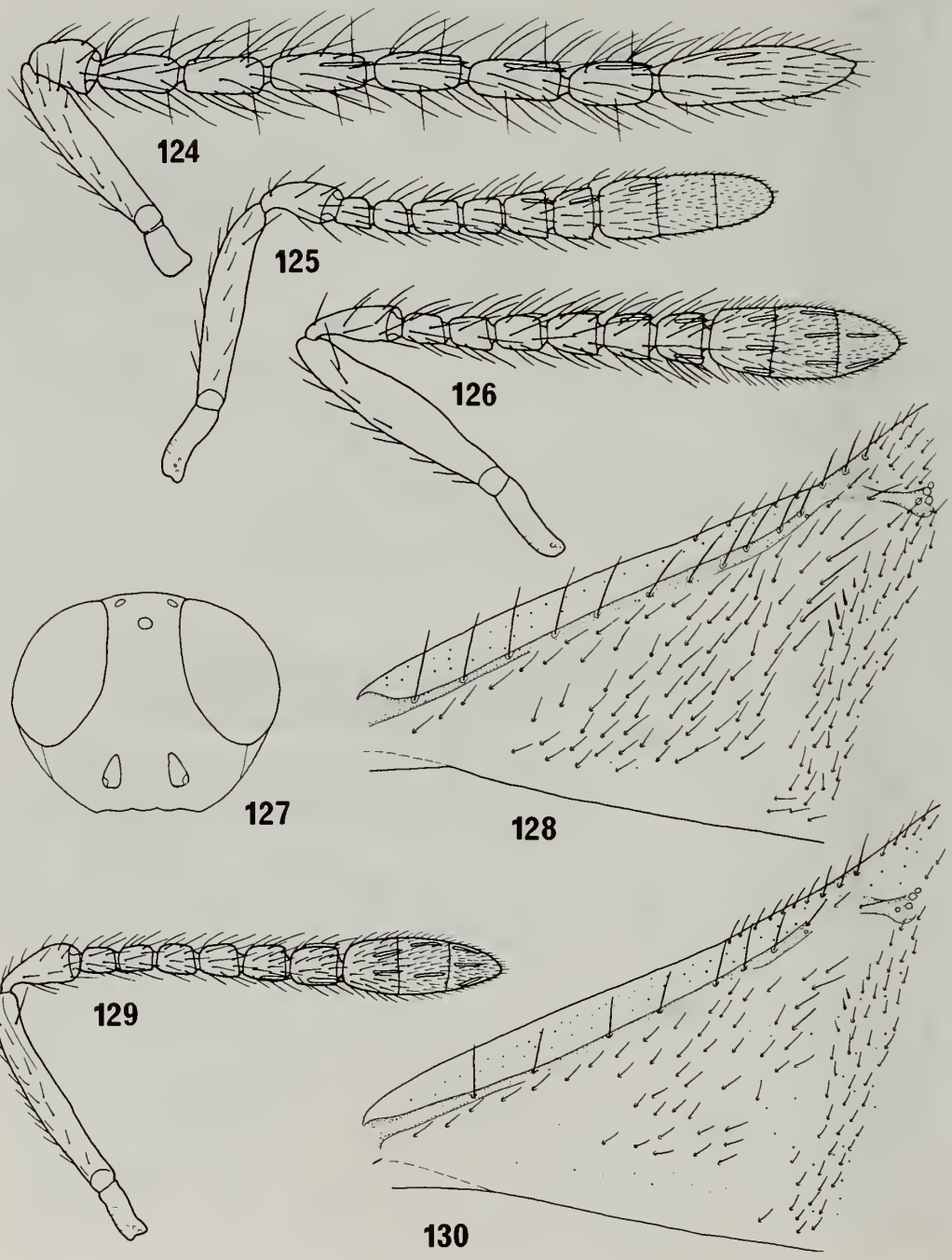
Figs 102–107 *O. flavipes* – 102, hypopygium. *O. dione* – 103, right forewing base, upper surface, ♀; 104, antenna including reverse side of clava which is slightly collapsed, ♀; 105, scutellum, ♀. *O. dryas* – 106, scutellum, ♀; 107, right forewing base, upper surface, ♀.



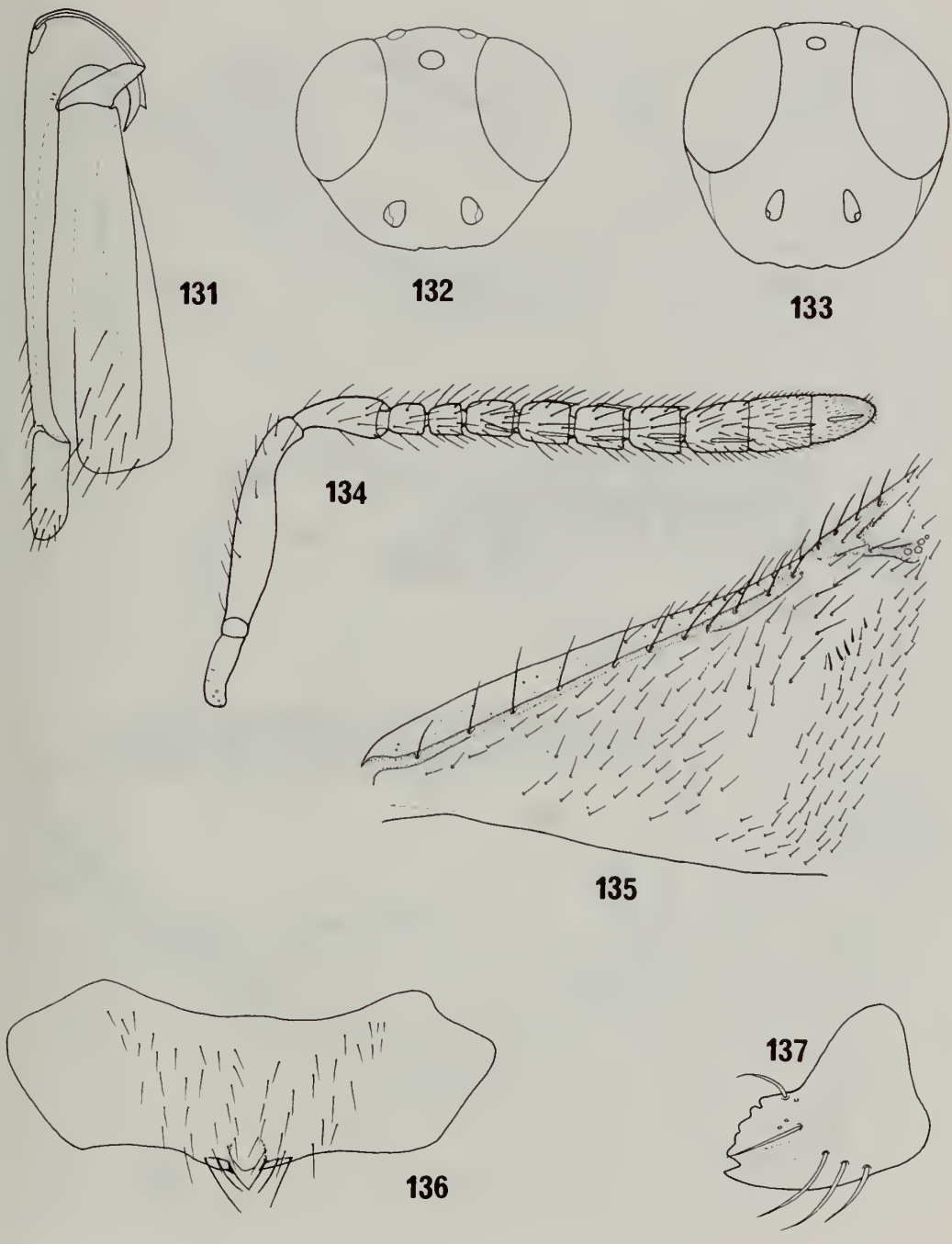
Figs 108–115 *O. ceres* – 108, antenna, ♀; 109, scutellum, ♀; 110, right forewing base, upper surface, ♀; 111, head, facial aspect, ♀; 112, hypopygium. *O. ilion* – 113, antenna including reverse side of clava, ♀; 114, left mandible; 115, right forewing base, upper surface, ♀.



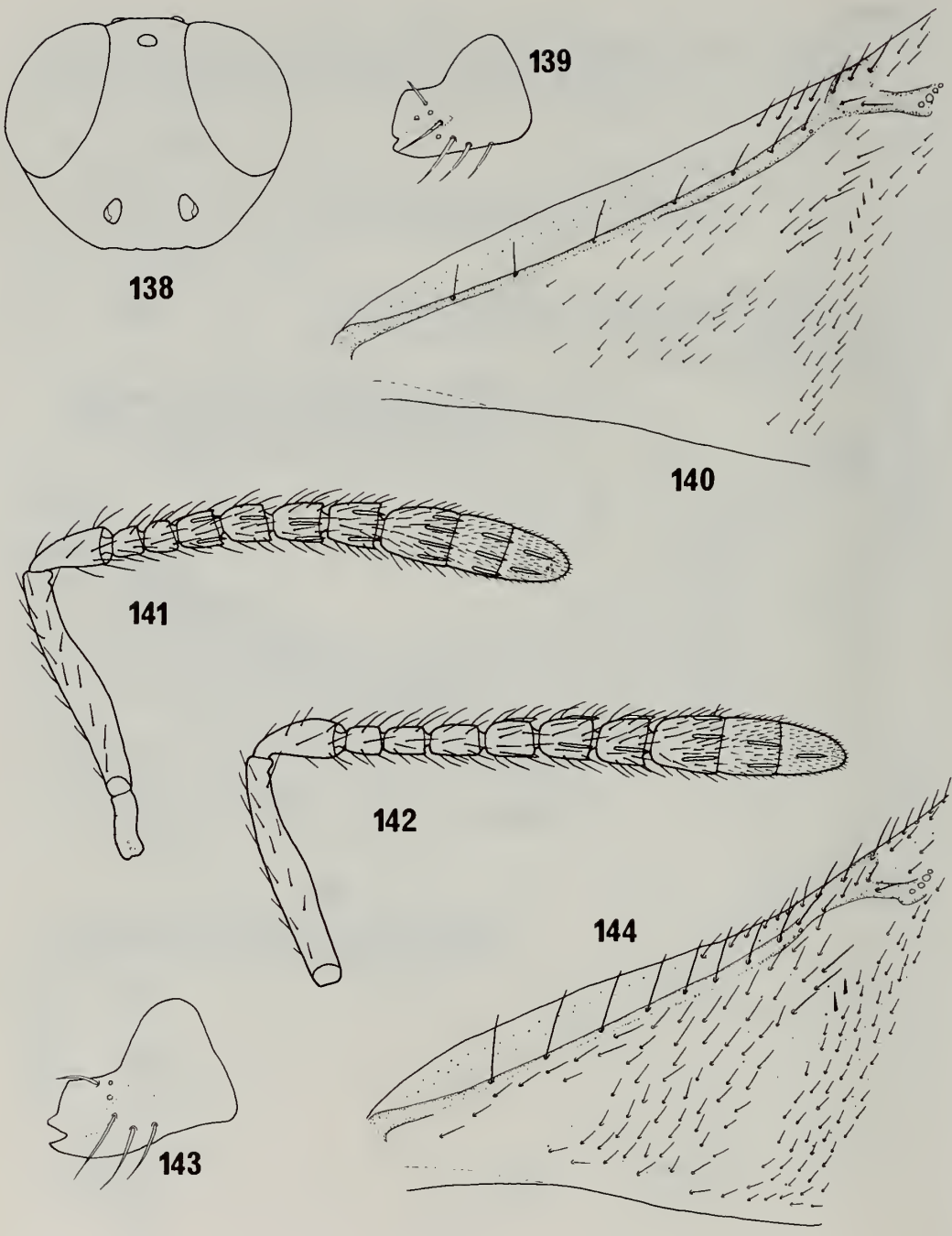
Figs 116–123 *O. ilion* – 116, ovipositor. *O. iris* – 117, head, facial aspect, ♀; 118, hypopygium; 119, right forewing base, upper surface, ♀. *O. javanicus* – 120, antenna, ♀; 121, left mandible; 122, ovipositor; 123, right forewing base, upper surface, ♀.



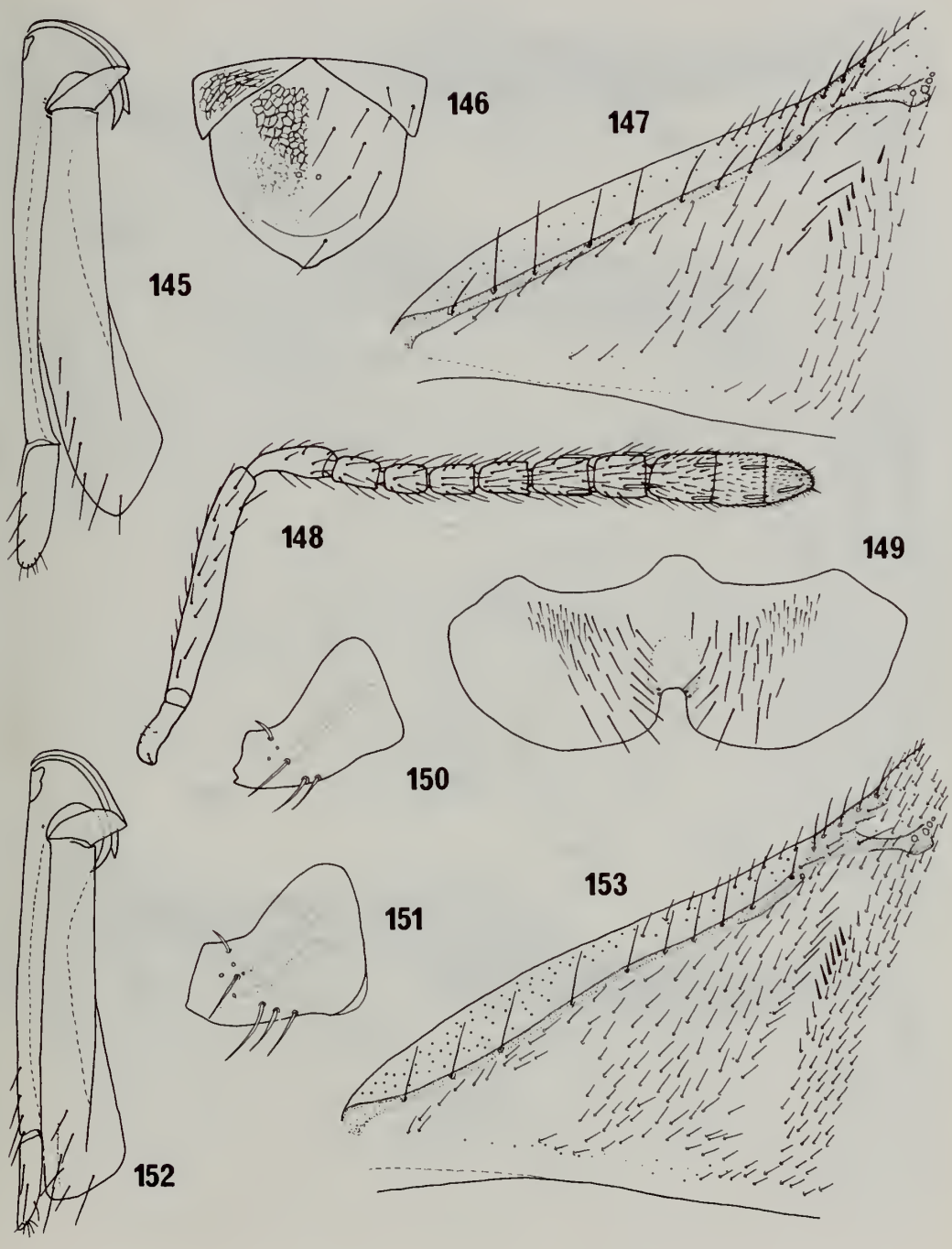
Figs 124–130 *O. javanicus* – 124, antenna, ♂. *O. iulus* – 125, 126, antenna, variants, ♀; 127, head, facial aspect, ♀; 128, right forewing, upper surface, ♀. *O. ixion* – 129, antenna, ♀; 130, right forewing base, upper surface, ♀.



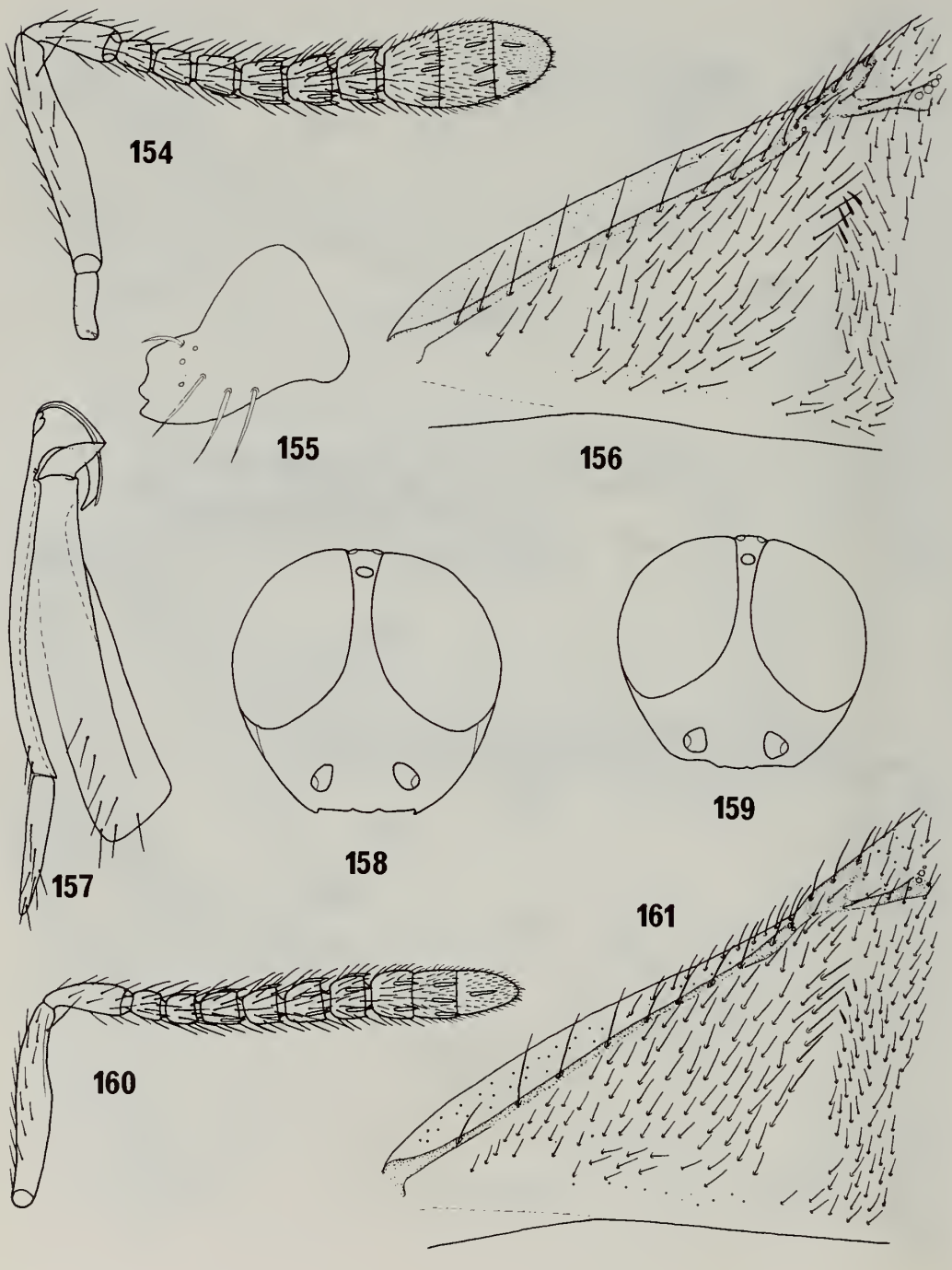
Figs 131–137 *O. ixion* – 131, ovipositor; 132, head, facial aspect, ♀. *O. elissa* – 133, head, facial aspect, ♀; 134, antenna, ♀; 135, right forewing base, upper surface, ♀; 136, hypopygium; 137, left mandible.



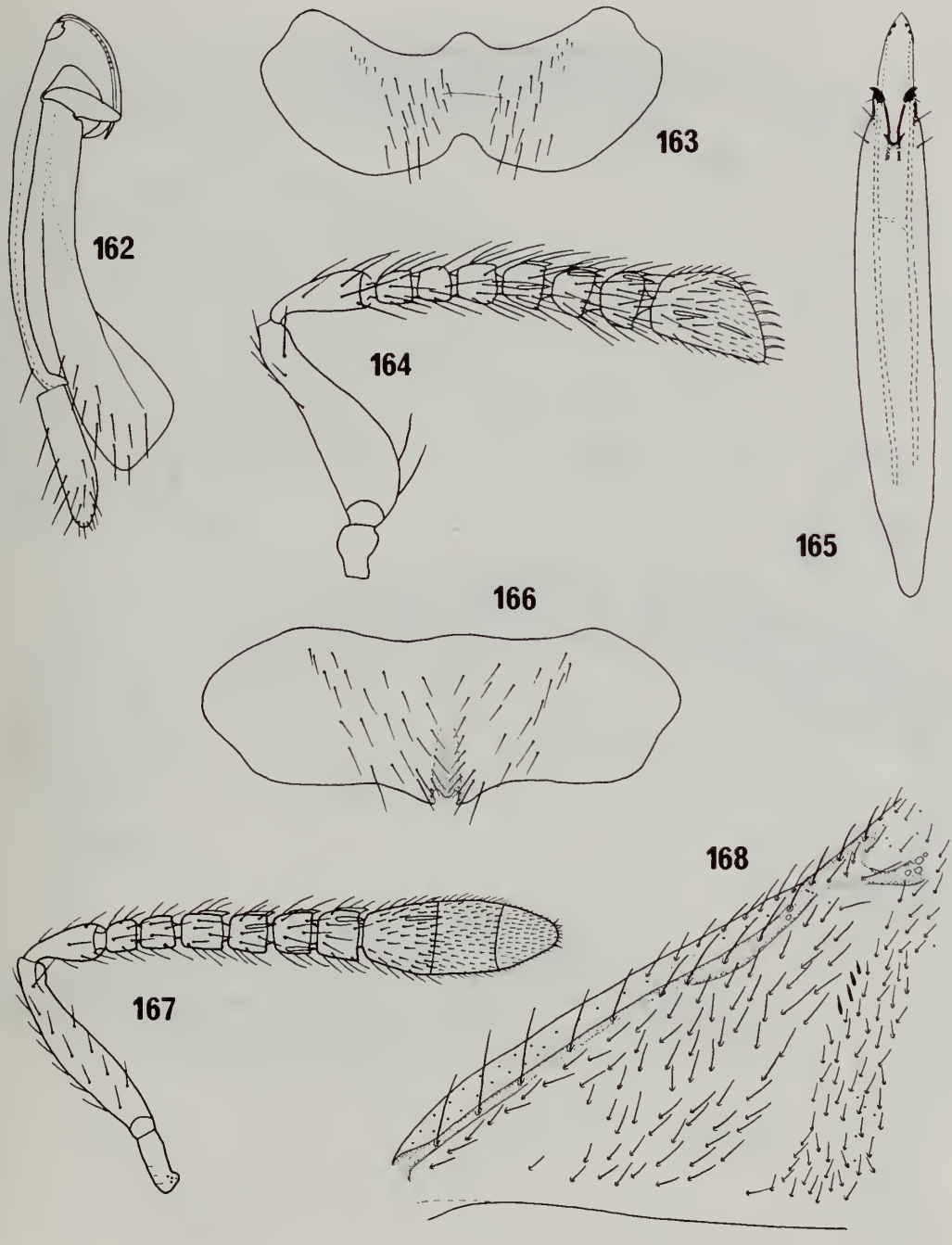
Figs 138–144 *O. egeria* – 138, head, facial aspect, ♀; 139, leaft mandible; 140, right forewing base, upper surface, ♀. *O. erebus* – 141, 142, antenna, variants, ♀; 143, left mandible; 144, right forewing base, upper surface, ♀.



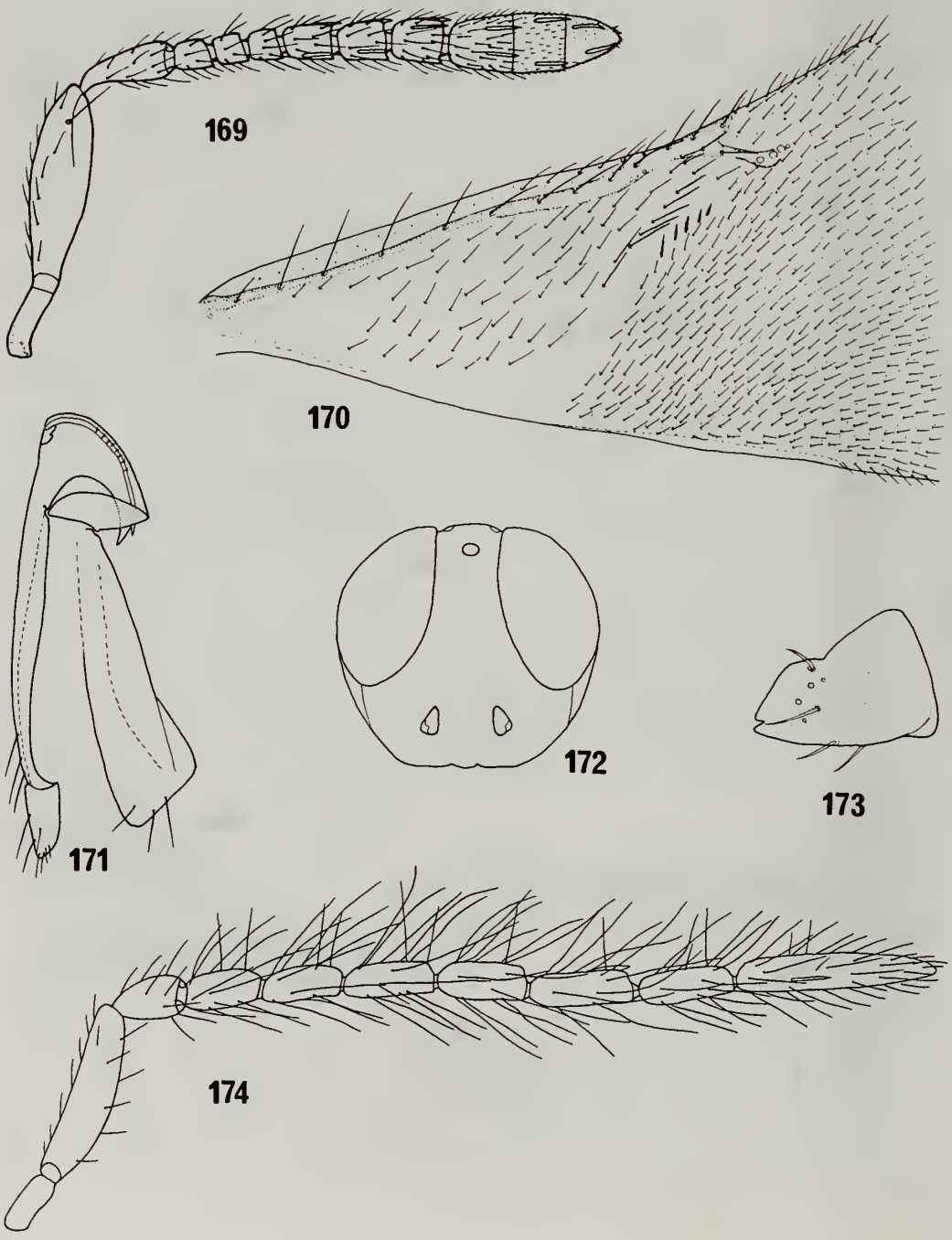
Figs 145–153 *O. erebus* – 145, ovipositor; 146, scutellum, ♀; 147, right forewing base, upper surface, ♀. *O. endymion* – 148, antenna, ♀; 149, hypopygium; 150, 151, left mandible, variants; 152, ovipositor; 153, right forewing, upper surface, ♀.



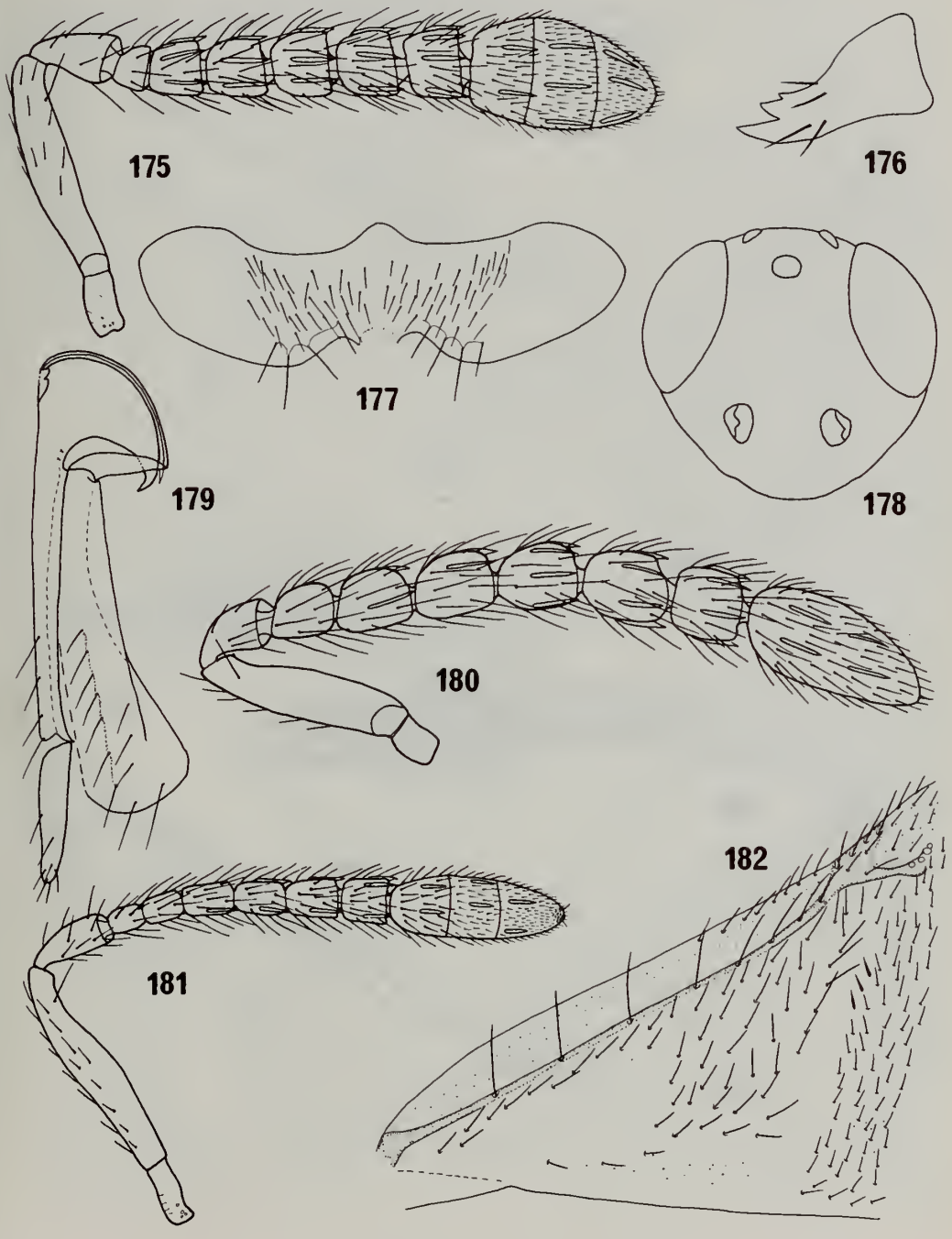
Figs 154–161 *O. hymen* – 154, antenna, ♀; 155, left mandible; 156, right forewing base, upper surface; 157, ovipositor; 158, head, facial aspect, ♀. *O. belus* – 159, head, facial aspect, ♀; 160, right antenna, outer apsect, ♀; 161, right forewing base, upper surface, ♀.



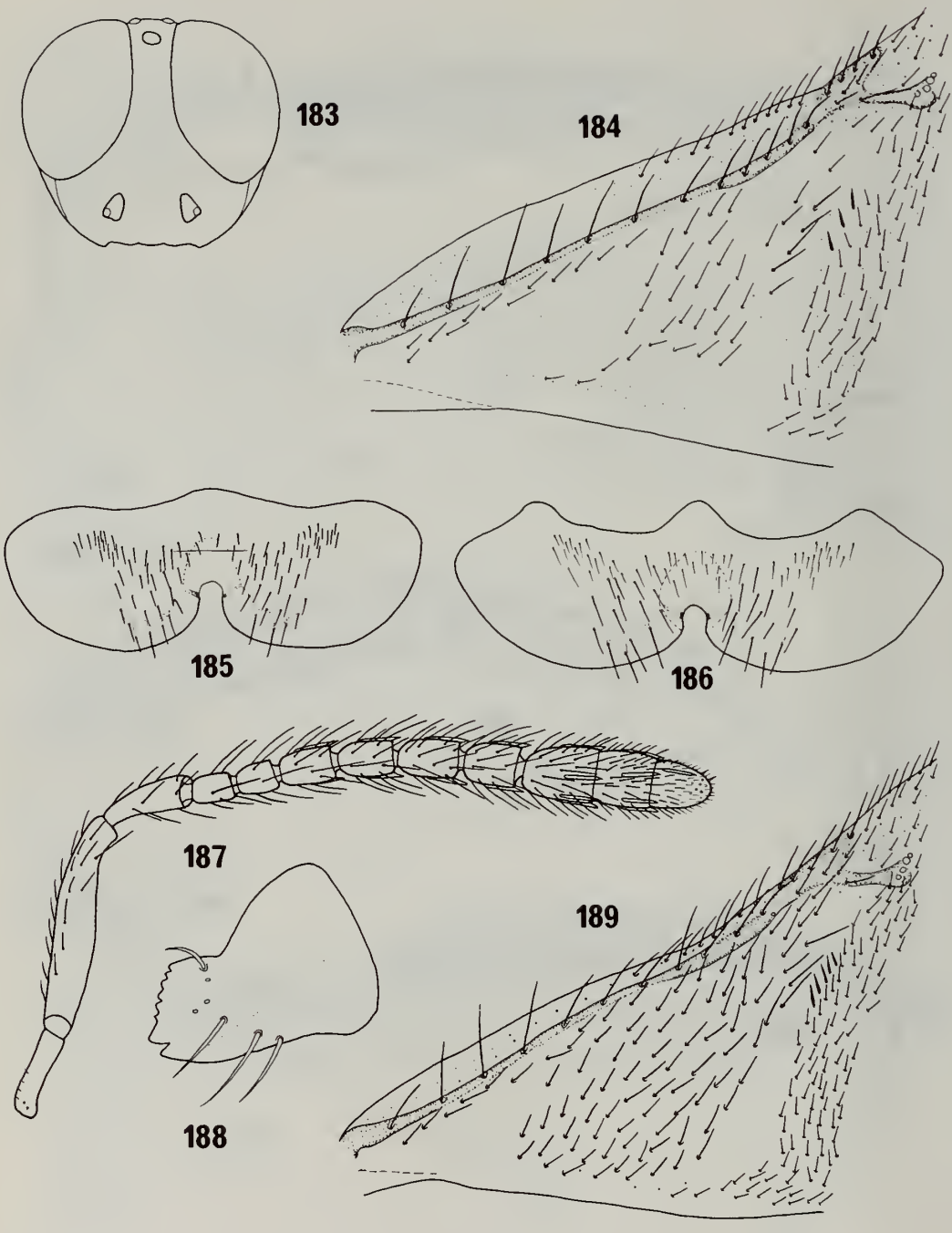
Figs 162–168 *O. belus* – 162, ovipositor; 163, hypopygium; 164, antenna, ♂; 165, genitalia, ♂. *O. bacchus* – 166, hypopygium; 167, antenna, ♀; 168, right forewing base, upper surface, ♀.



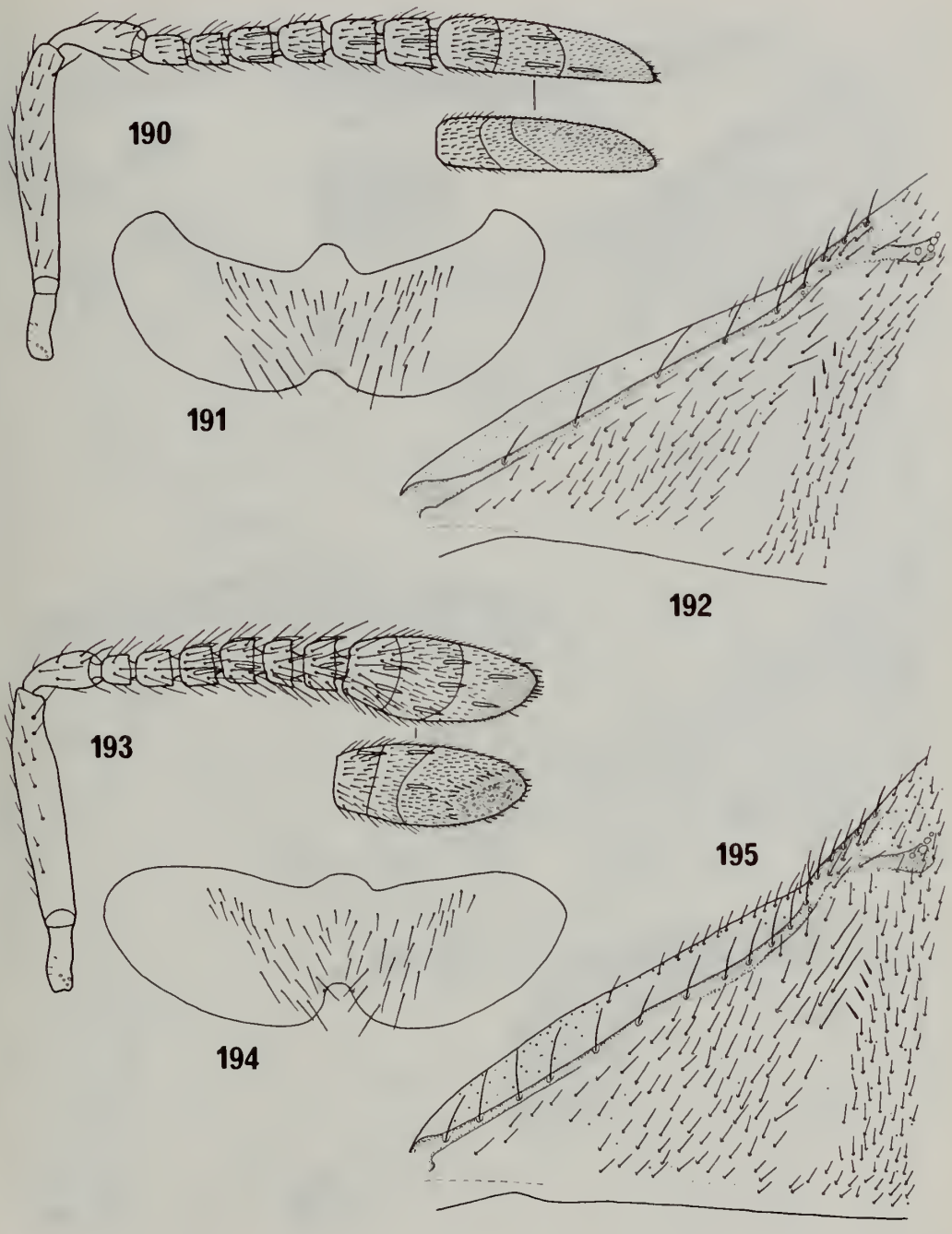
Figs 169–174 *O. pacificus* – 169, antenna, ♀; 170, right forewing base, upper surface, ♀; 171, ovipositor; 172, head, facial aspect, ♀; 173, left mandible; 174, antenna, ♂.



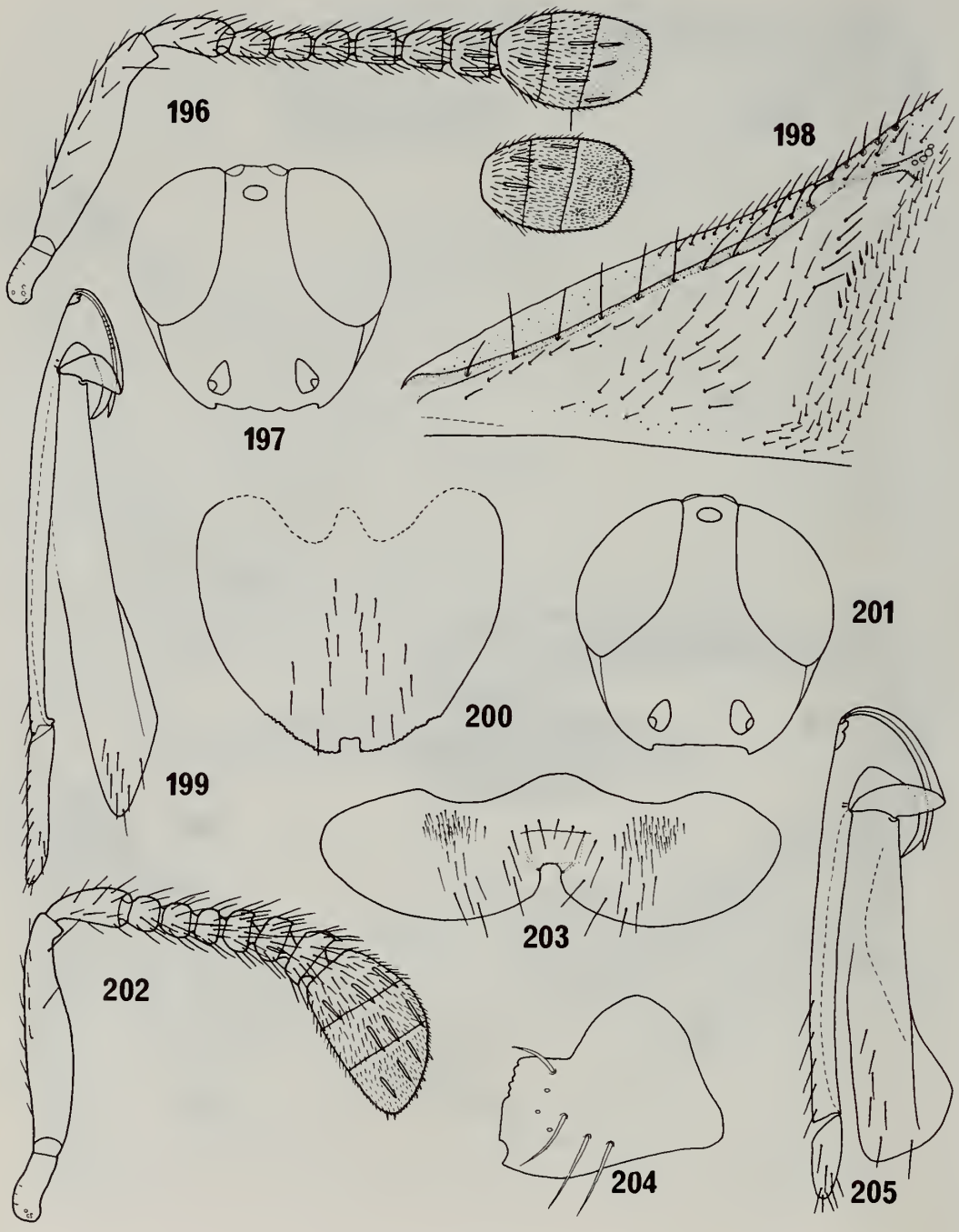
Figs 175–182 *O. larvarum* – 175, antenna, ♀; 176, left mandible; 177, hypopygium; 178, head, facial aspect, ♂; 179, ovipositor; 180, antenna, ♀. *O. pallidipes* – 181, antenna, ♀; 182, right forewing base, upper surface, ♀.



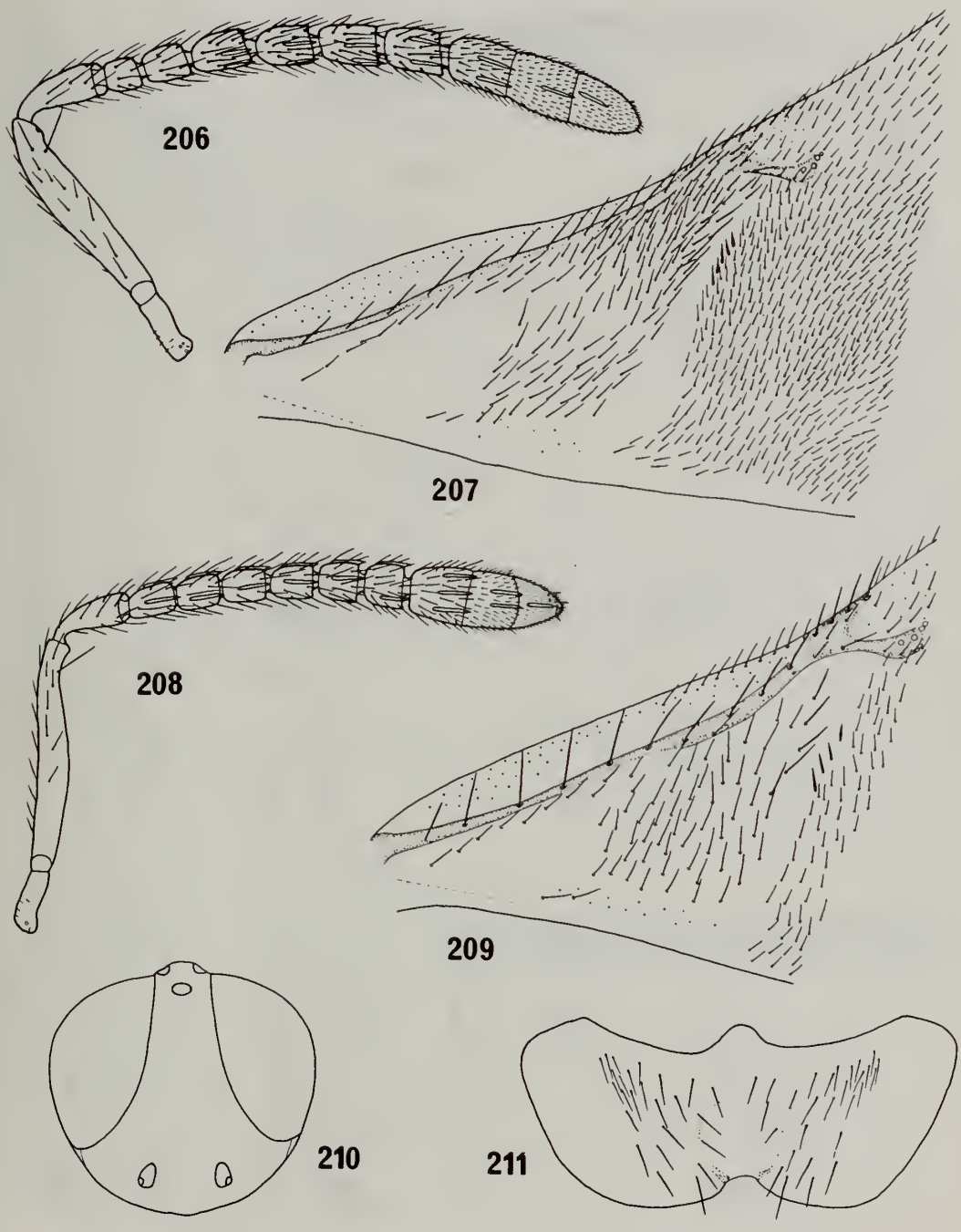
Figs 183–189 *O. pallidipes* – 183, head, facial aspect, ♀; 184, right forewing base, upper surface, ♀; 185, 186, hypopygium, variants, ♀. *O. pilosus* – 187, antenna, ♀; 188, left mandible, ♀; 189, right forewing, upper surface, ♀.



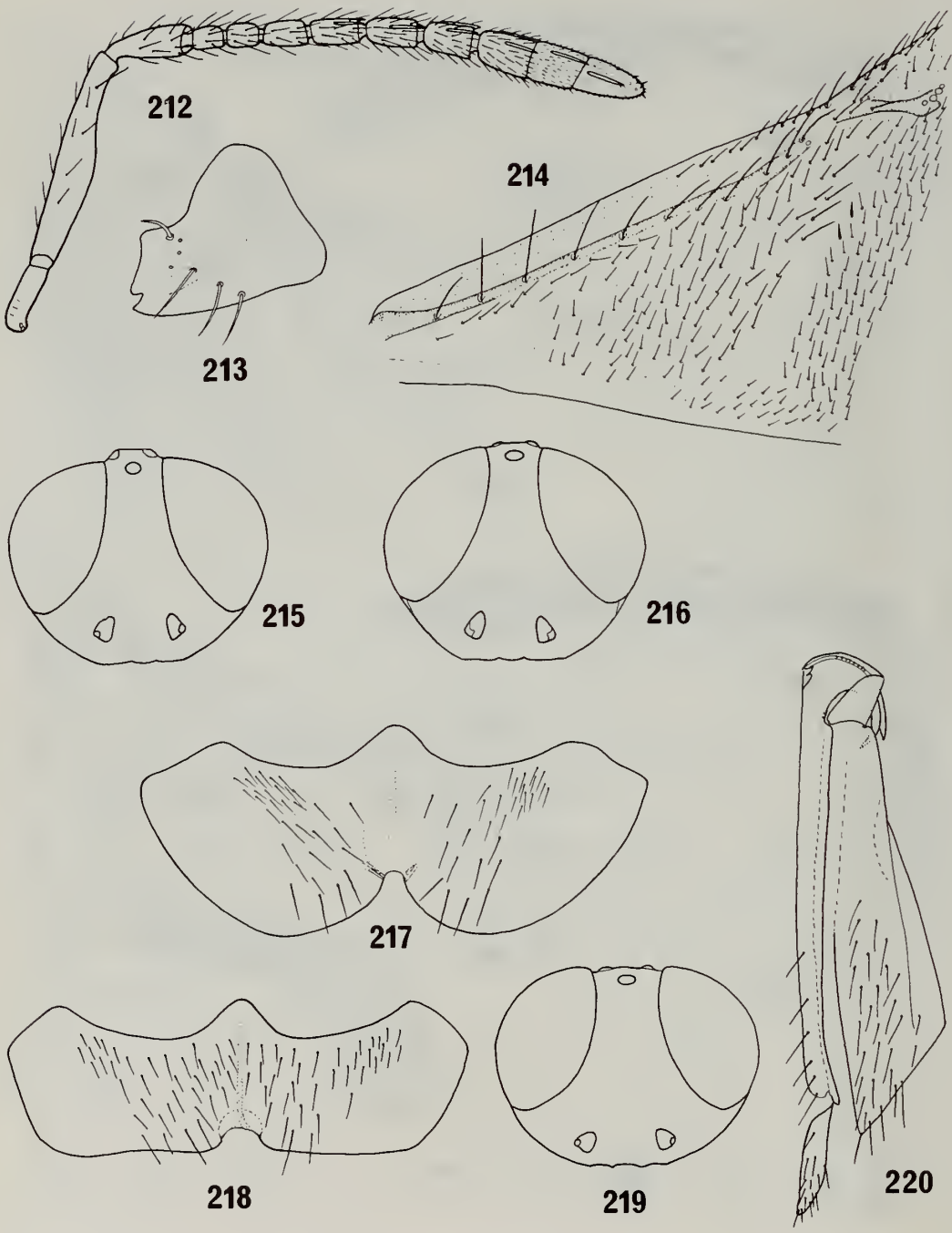
Figs 190–195 *O. valcanus* – 190, antenna including reverse of clava, ♀; 191, hypopygium; 192, right forewing, upper surface, ♀. *O. urania* – 193, antenna including reverse of clava, ♀; 194, hypopygium; 195, right forewing base, upper surface, ♀.



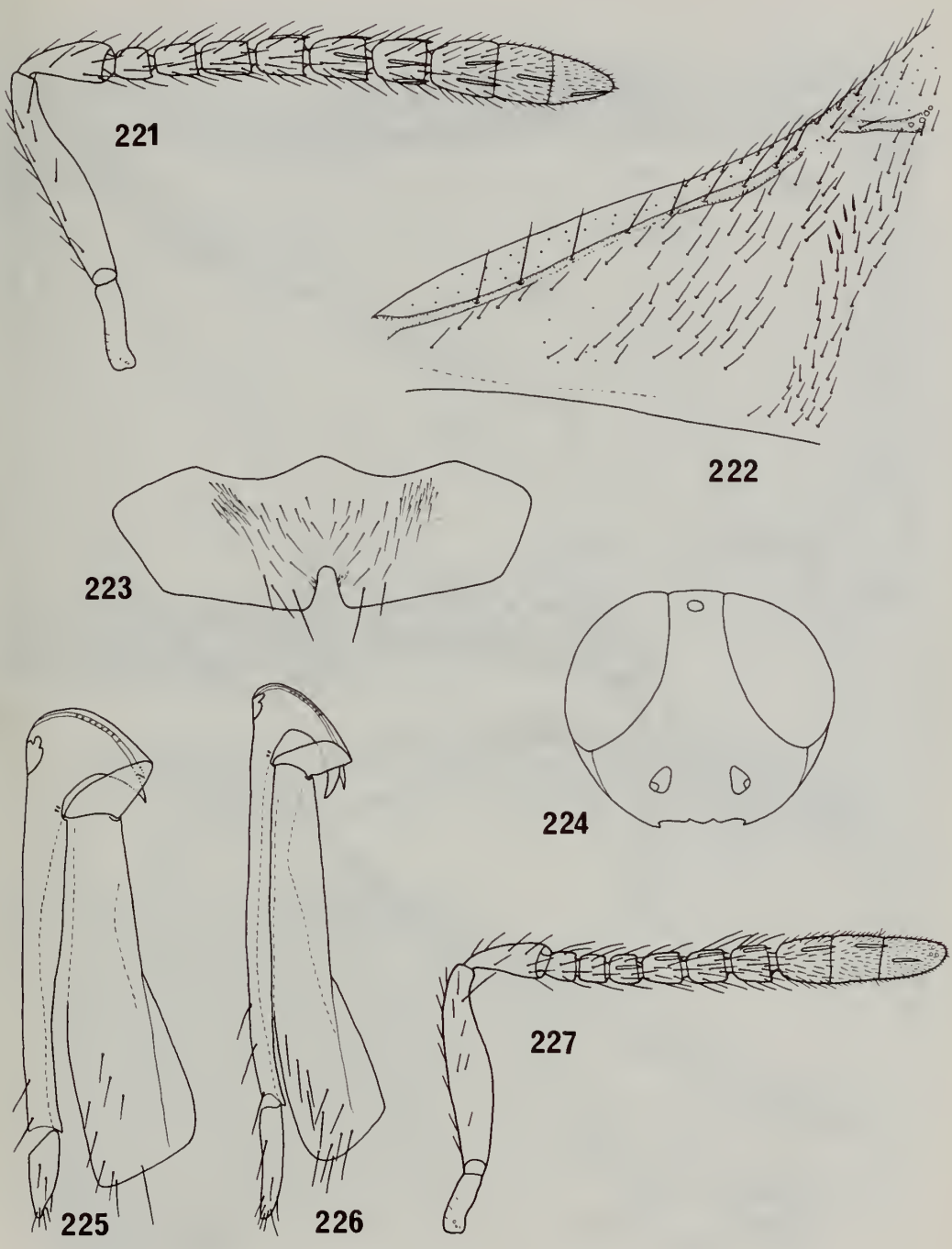
Figs 196–205 *O. vertumnus* – 196, antenna including reverse of clava, clava slightly collapsed,; ♀; 197, head, facial aspect, ♀; 198, right forewing base, upper surface, ♀; 199, ovipositor; 200, hypopygium. *O. vesta* – 201, head, facial aspect, ♀; 202, antenna, ♀. *O. boreas* – 203, hypopygium; 204, left mandible; 205, ovipositor.



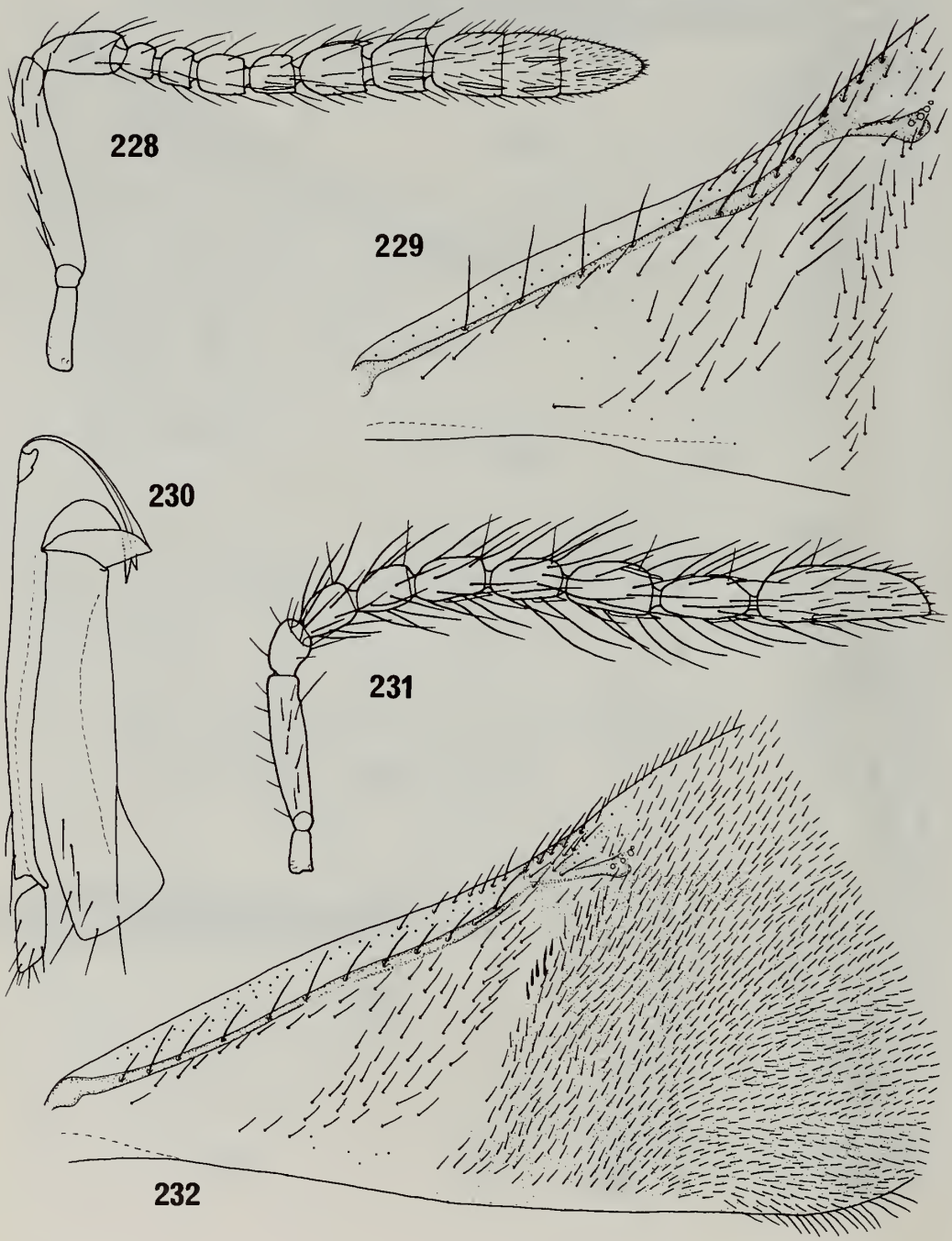
Figs 206–211 *O. boreas* – 206, antenna, ♀; 207, right forewing base, upper surface; ♀. *O. clio* – 208, antenna, ♀; 209, right forewing base, upper surface, ♀; 210, head, facial aspect, ♀; 211, hypopygium.



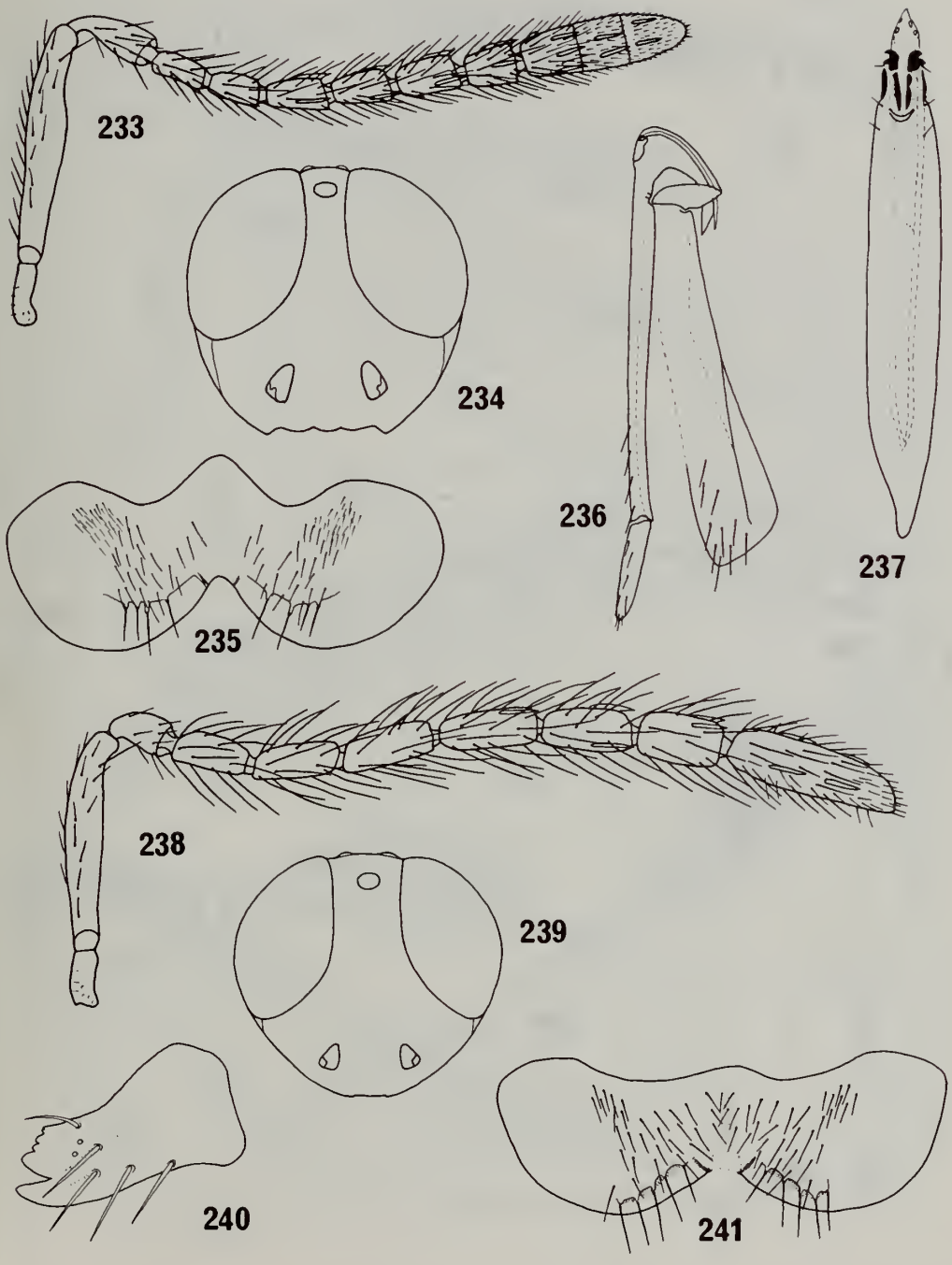
Figs 212–220 *O. circe* – 212, antenna, ♀; 213, left mandible; 214, right forewing base, upper surface, ♀; 215, 216, head, facial aspect, variants, ♀; 217, hypopygium. *O. clotho* – 218, hypopygium; 219, head, facial aspect, ♀; 220, ovipositor.



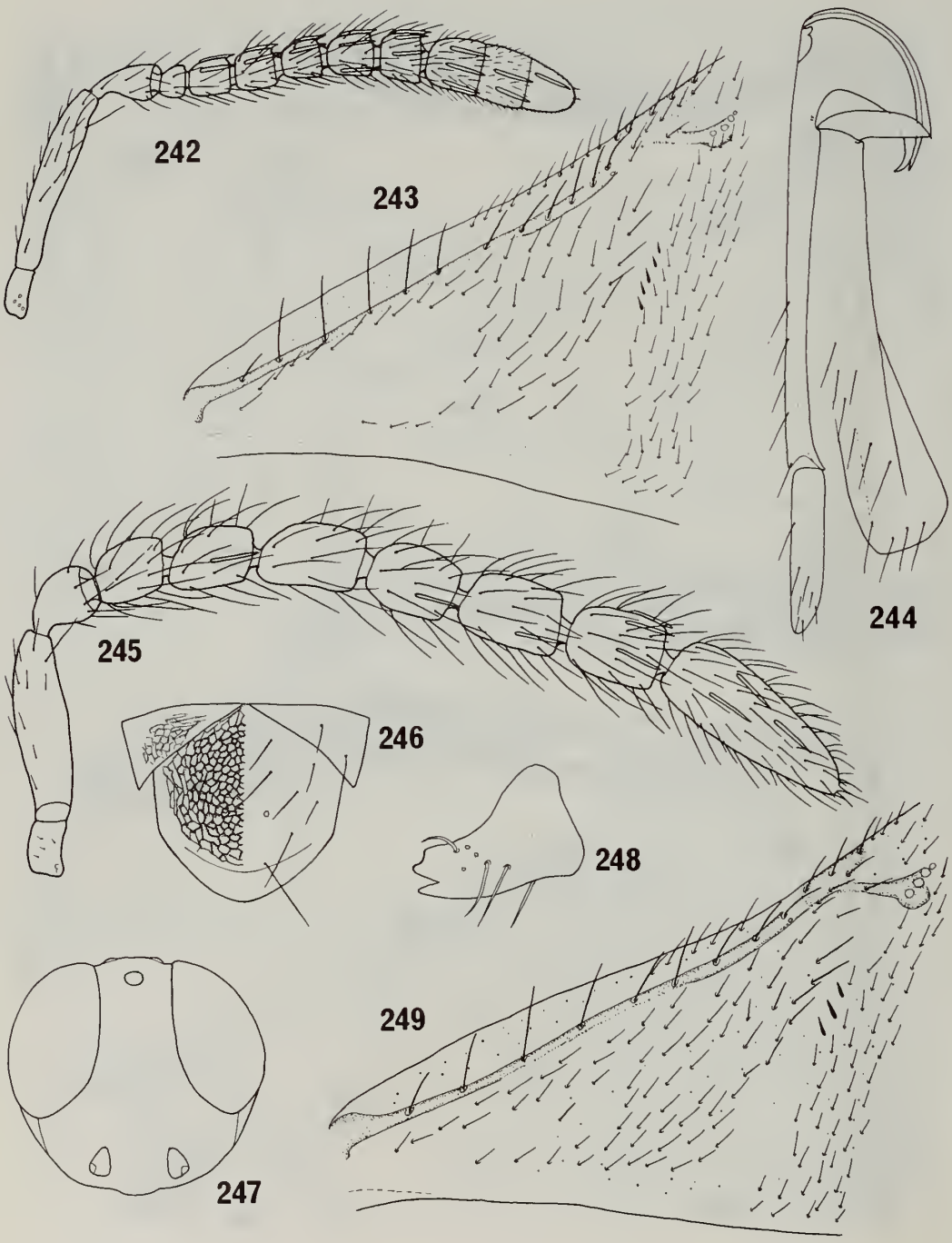
Figs 221–227 *O. cybele*– 221, antenna, ♀; 222, right forewing base, upper surface, ♀; 223, hypopygium; 224, head, facial aspect, ♀; 225, ovipositor. *O. ooii* – 226, ovipositor. *O. crassulus* – 227, antenna, ♀.



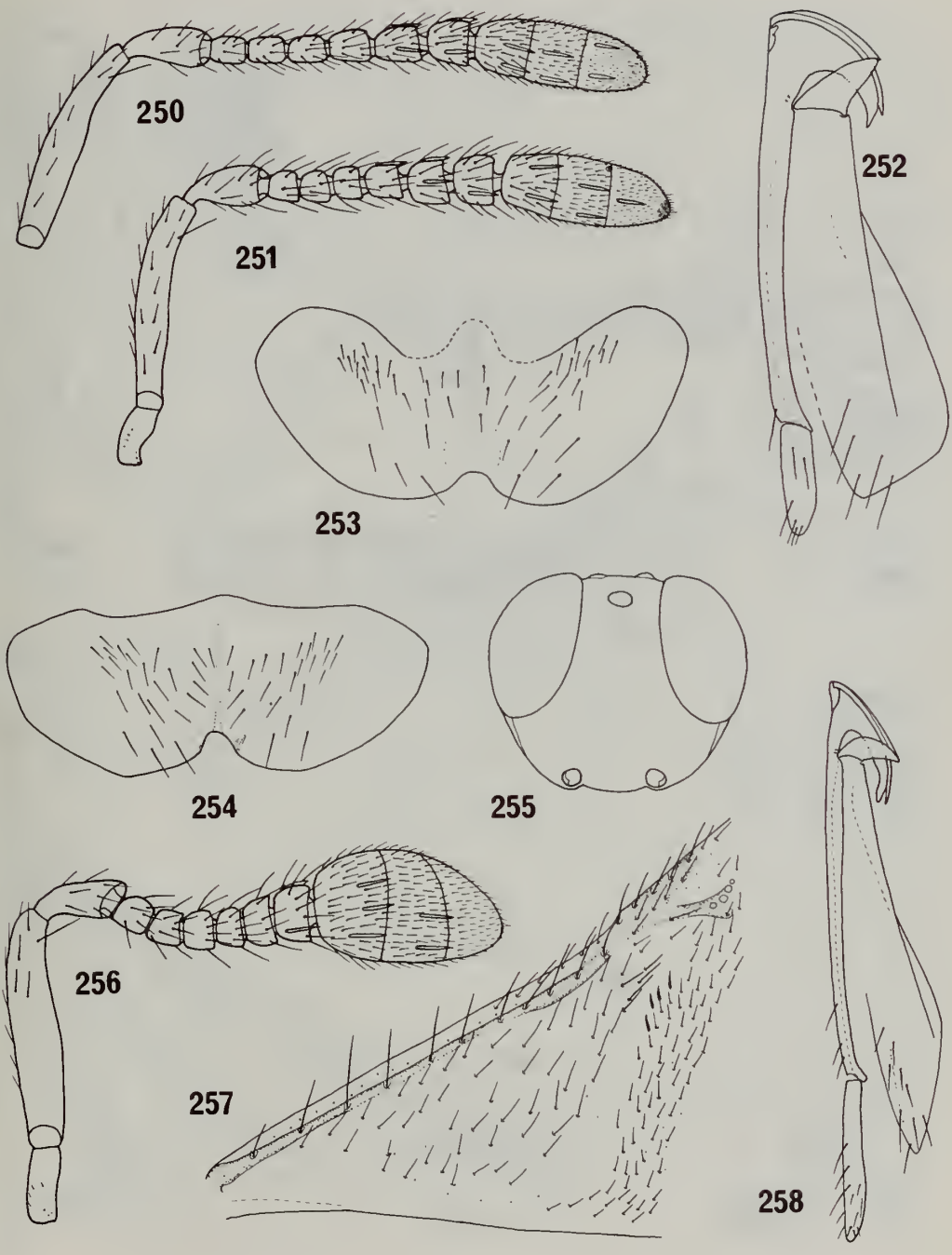
Figs 228–232 *O. lucina* – 228, right antenna, outer aspect, ♀; 229, right forewing base, upper surface, ♀; 230, ovipositor; 231, antenna, ♂. *O. macula* – 232, right forewing base, upper surface, ♀.



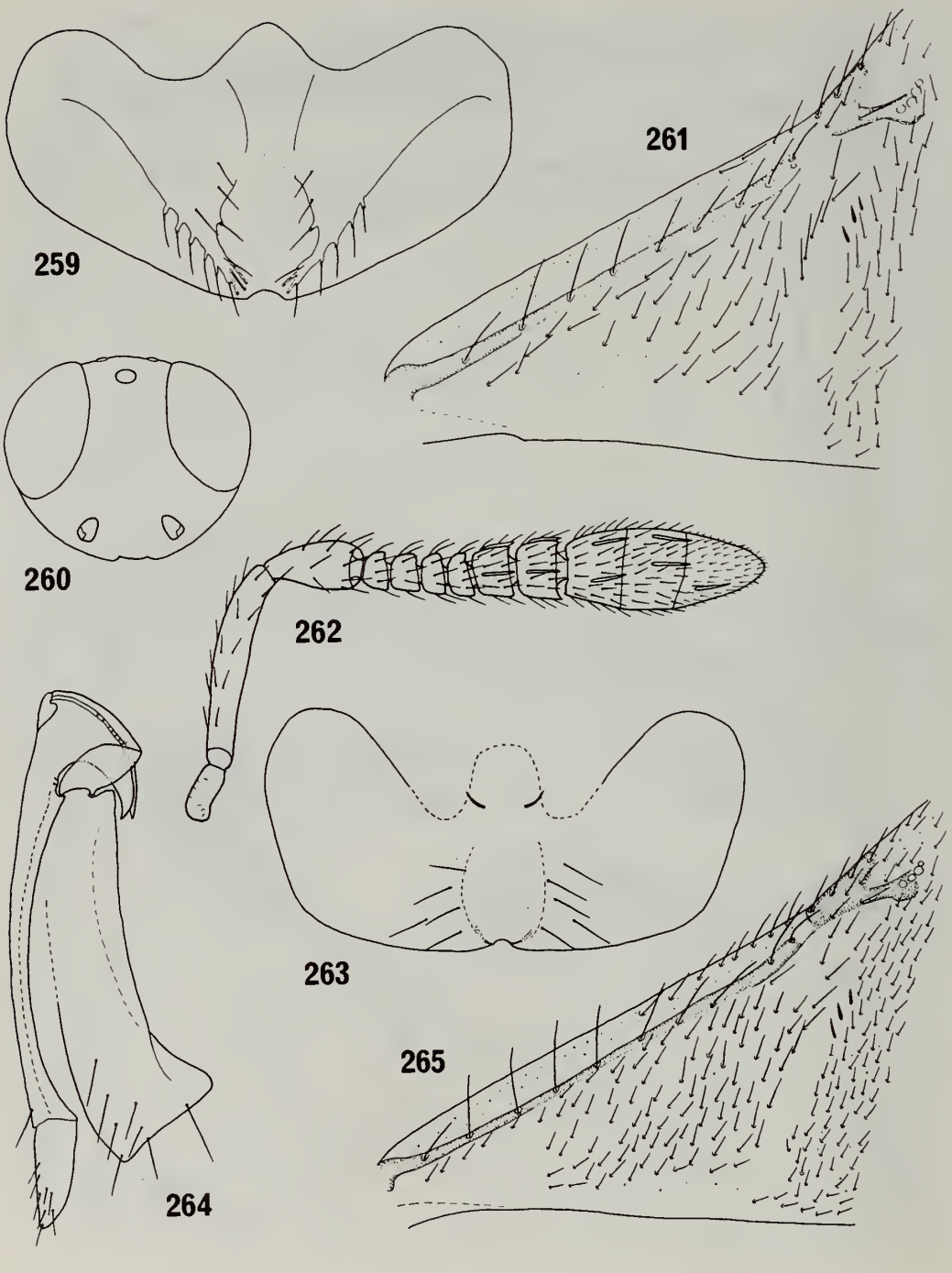
Figs 233–241 *O. macula* – 233, antenna, ♀; 234, head, facial aspect, ♀; 235, hypopygium; 236, ovipositor; 237, genitalia, ♂; 238, antenna, ♂. *O. hera* – 239, head, facial aspect, ♀; 240, left mandible, ♀; 241, hypopygium.



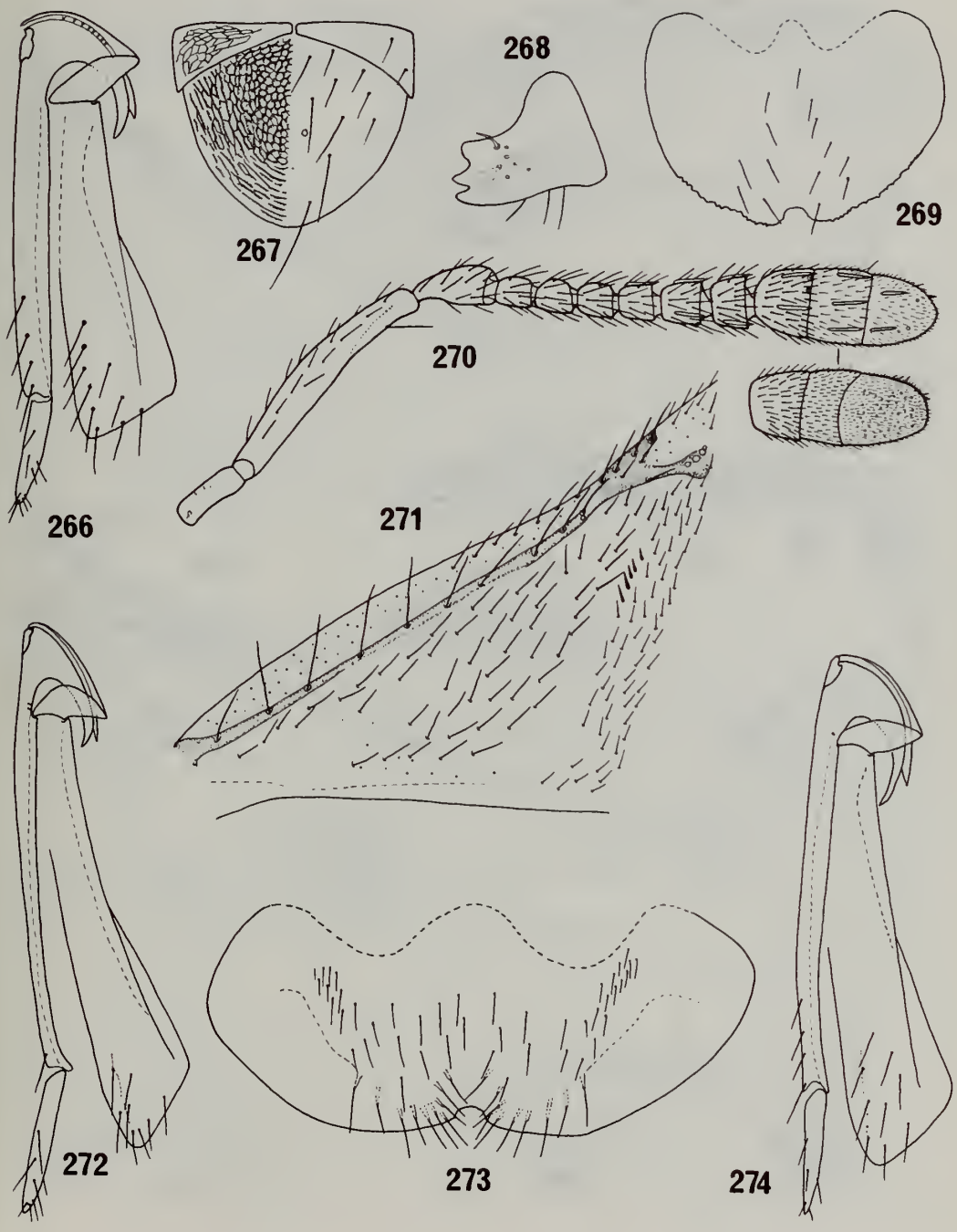
Figs 242–249 *O. hera* – 242, antenna, ♀; 243, right forewing base, upper surface, ♀; 244, ovipositor; 245, antenna, ♂. *O. manii* – 246, scutellum, ♀; 247, head, facial aspect, ♀; 248, left mandible; 249, right forewing base, upper surface, ♀.



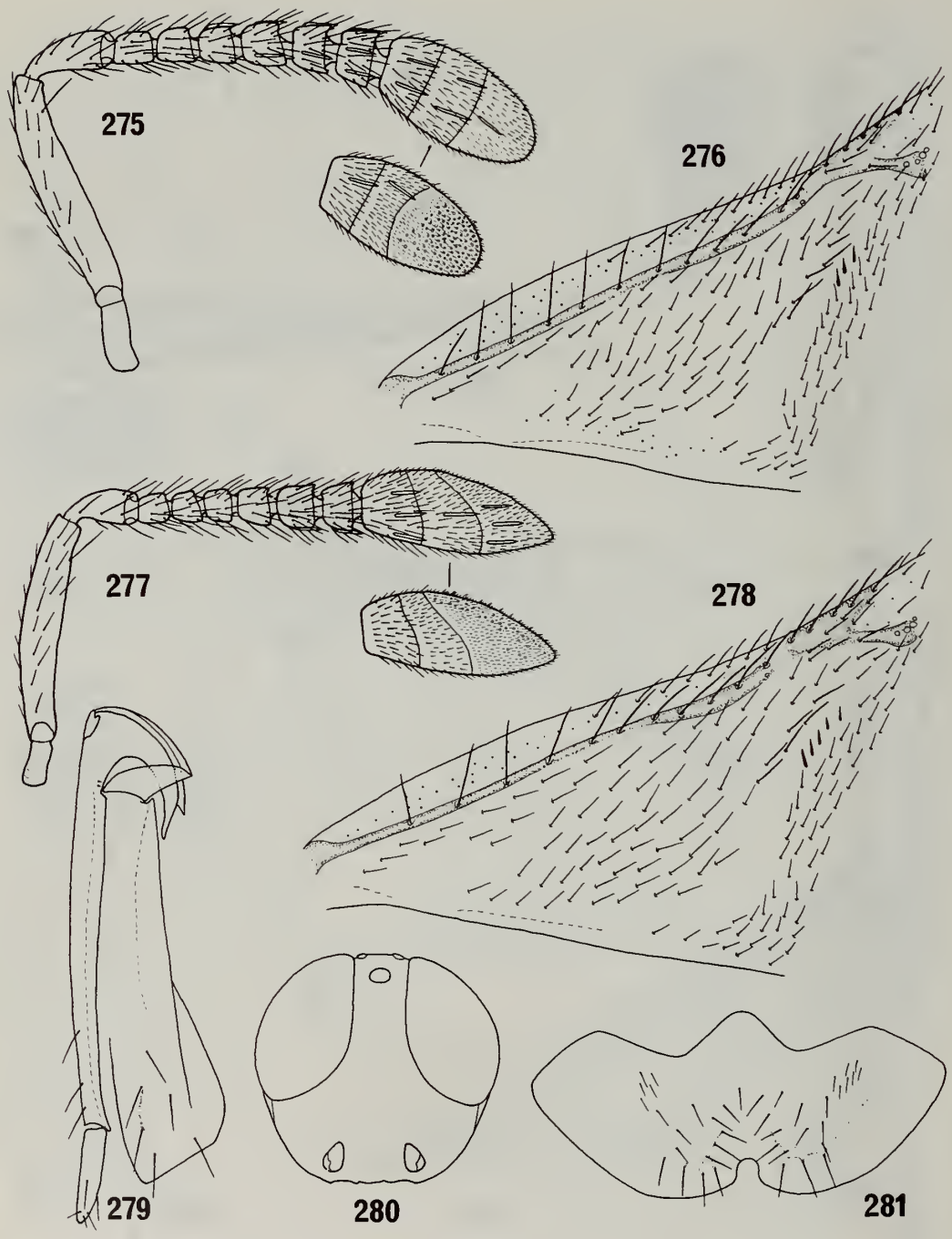
Figs 250–258 *O. manii* – 250, 251, antennae, variants, ♀; 252, ovipositor; 253, 254, hypopygium, variants, ♀. *O. midas* – 255, head, facial aspect, ♀; 256, antenna, ♀; 257, right forewing base, upper surface, ♀; 258, ovipositor.



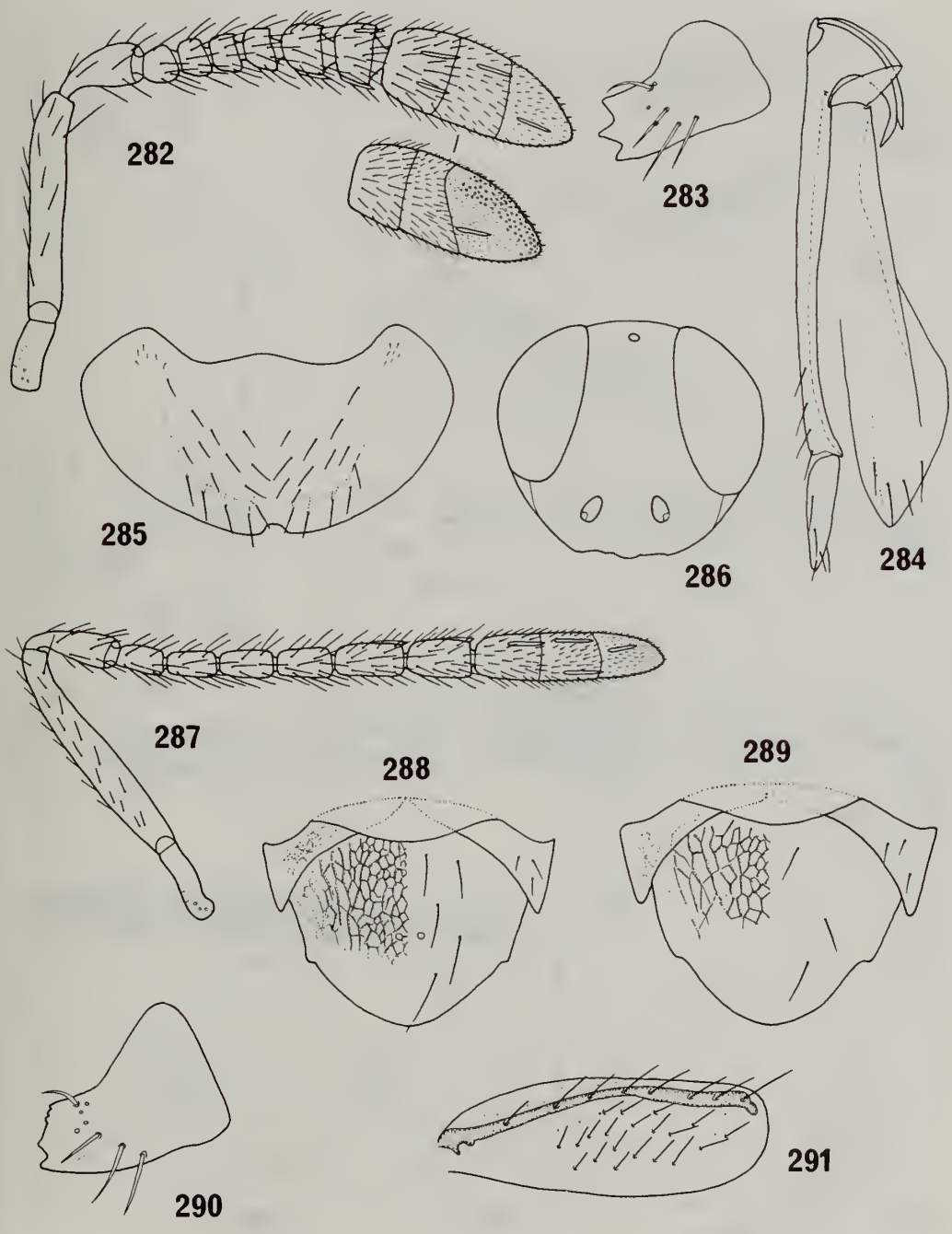
Figs 259–265 *O. midas* – 259, hypopygium. *O. mars* – 260, head, facial aspect, ♀; 261, right forewing base, upper surface, ♀; 262, antenna, ♀; 263, hypopygium; 264, ovipositor. *O. neptunus* – 265, right forewing base, upper surface, ♀.



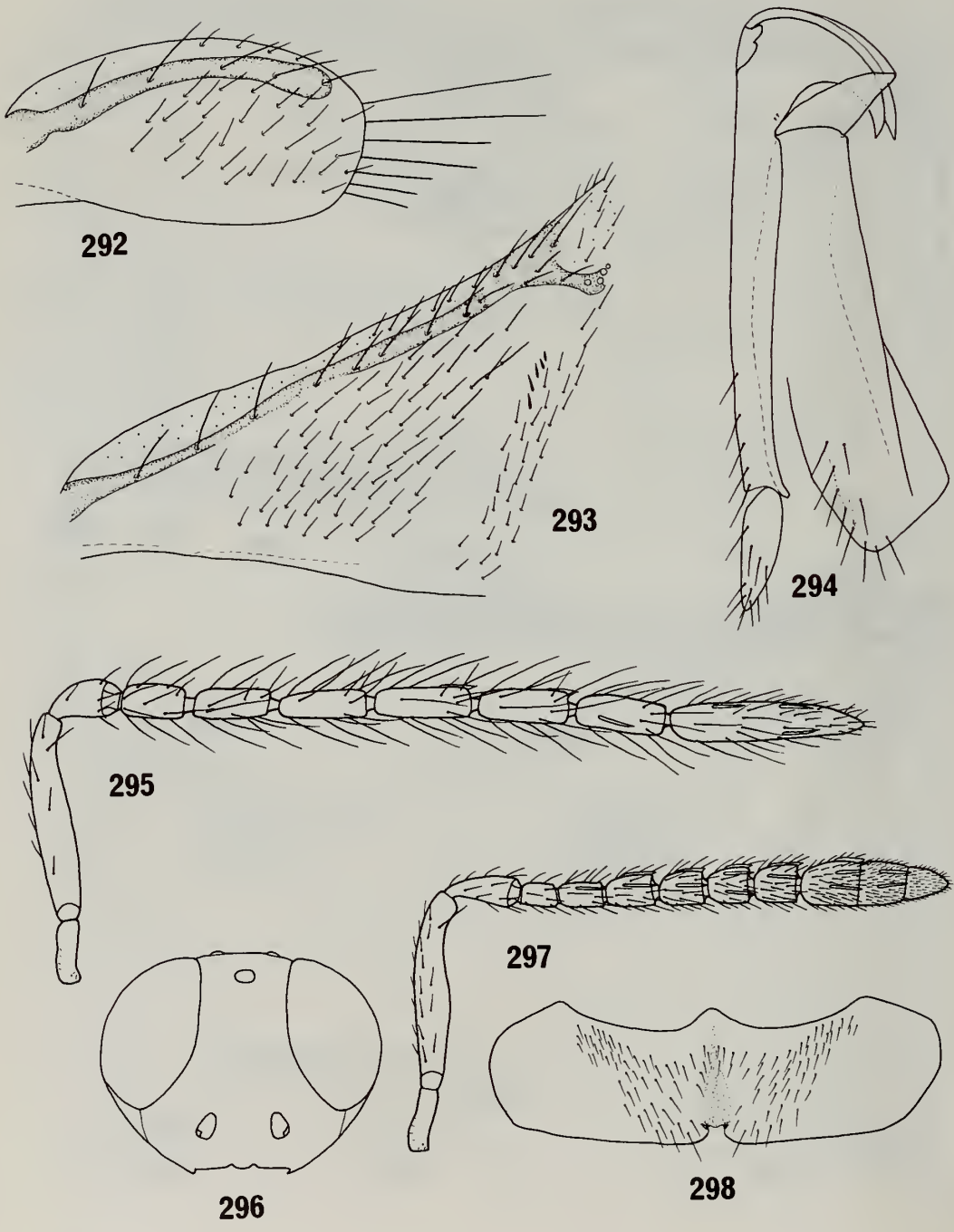
Figs 266–274 *O. neptunus* – 266, ovipositor, ♀; 267, scutellum, ♀; 268, left mandible; 269, hypopygium. *O. libitina* – 270, antenna, ♀; 271, right forewing base, upper surface, ♀; 272, ovipositor. *O. lyaeus* – 273, hypopygium; 274, ovipositor.



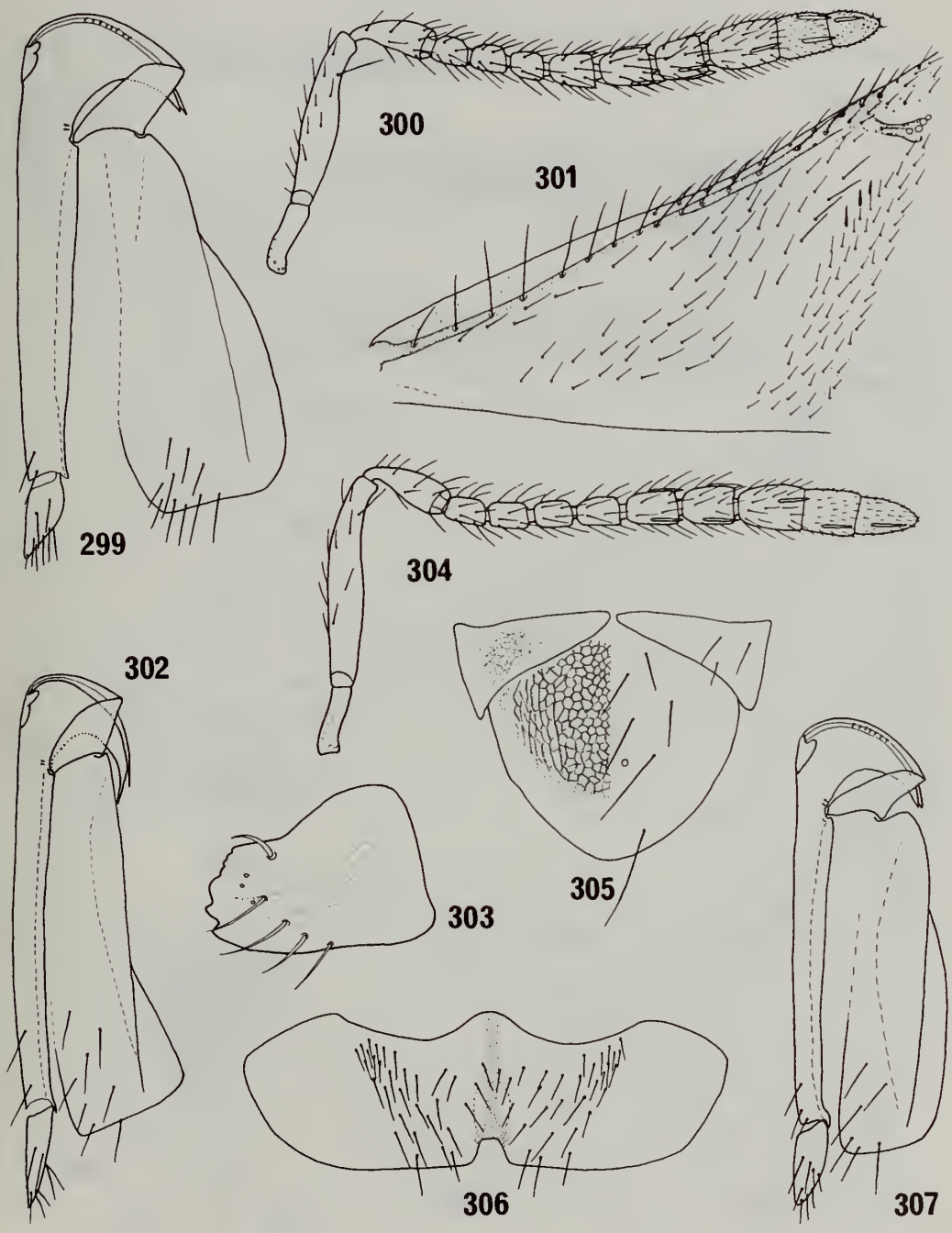
Figs 275–281 *O. lyaeus* – 275, antenna including reverse side of clava, ♀; 276, right forewing base, upper aspect, ♀. *O lupercus* – 277, antenna showing reverse side of clava, ♀; 278, right forewing, upper surface, ♀; 279, ovipositor; 280, head, facial view, ♀; 281, hypopygium.



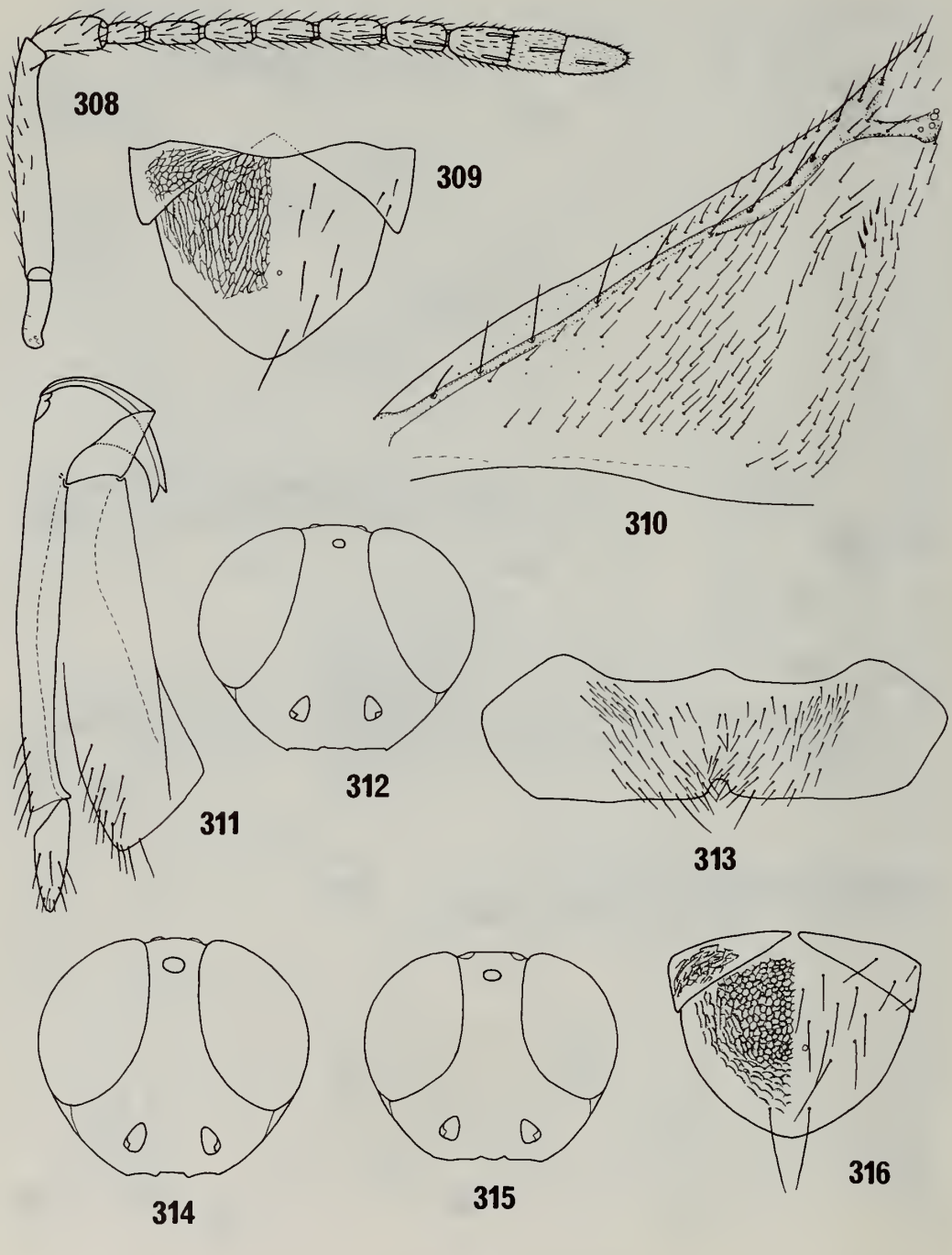
Figs 282–291 *O. maenas* – 282, antenna including reverse side of clava, ♀; 283, left mandible; 284, ovipositor; 285, hypopygium. *O. segestes* – 286, head, facial aspect, ♀; 287, antenna, ♀; 288, 289, scutellum, variants, ♀; 290, left mandible; 291, right forewing, upper surface, brachypterous form, variant, ♀.



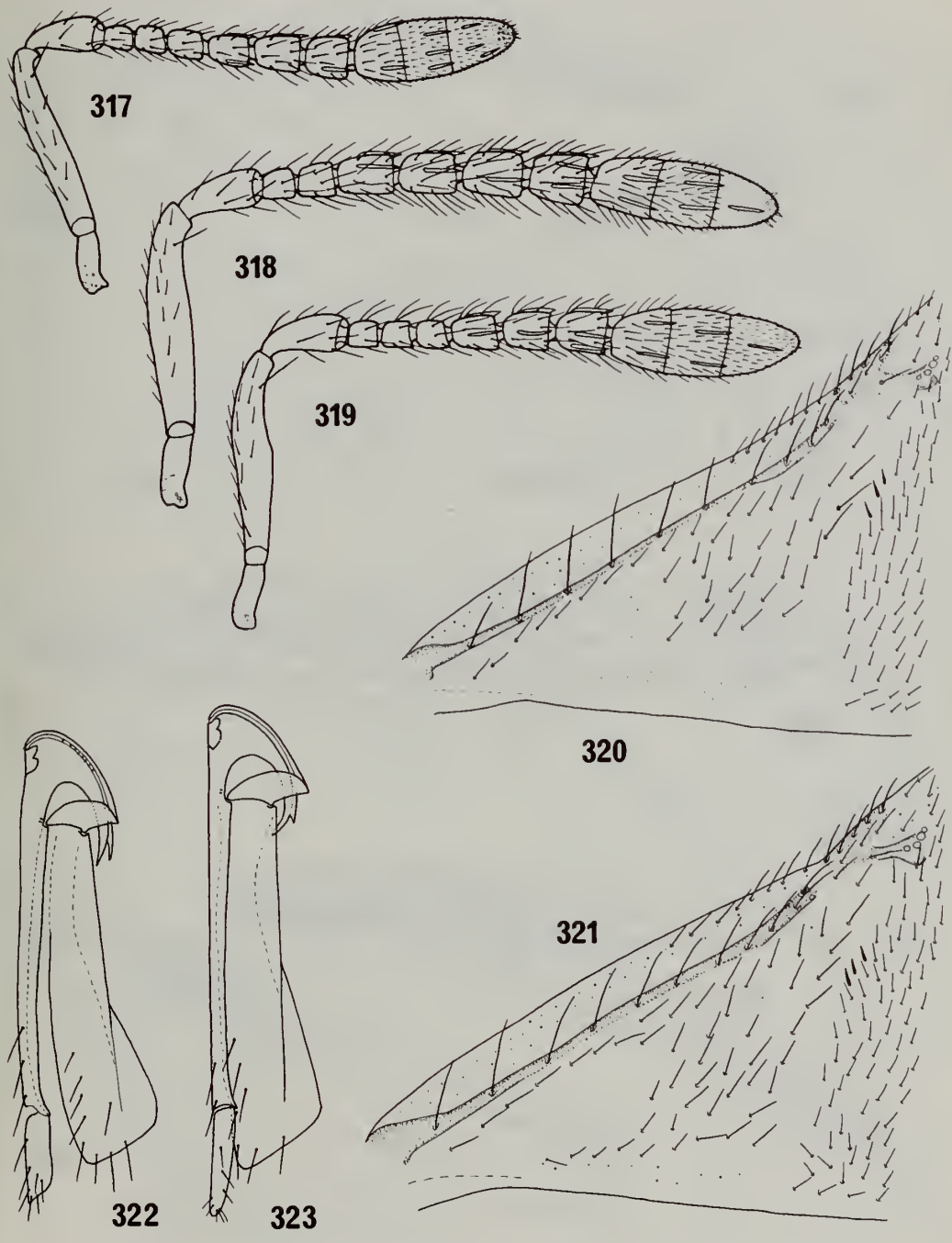
Figs 292–298 *O. segestes* – 292, right forewing, upper surface, brachypterous form, variant, ♀; 293, right forewing base, upper surface, macropterous form, ♀; 294, ovipositor; 295, antenna, ♂. *O ferrierei* – 296, head, facial view, ♀; 297, antenna, ♀; 298, hypopygium.



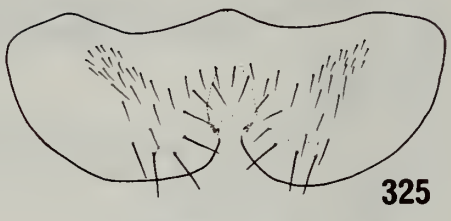
Figs 299–307 *O. ferrierei* – 299, ovipositor. *O. leander* – 300, antenna, ♀; 301, right forewing base, upper surface, ♀; 302, ovipositor; 303, laft mandible. *O. musa* – 304, antenna, ♀; 305, scutellum, ♀; 306, hypopygium; 307, ovipositor.

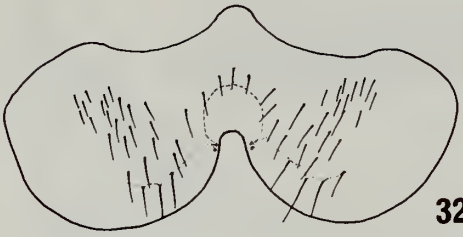


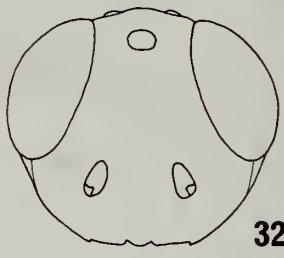
Figs 308–316 *O. telenomicida* – 308, antenna, ♀; 309, scutellum, ♀; 310, right forewing base, upper surface; 311, ovipositor 312, head, facial aspect, ♀; 313, hypopygium. *O. papilionis* – 314, 315, head, facial aspect, variants, ♀; 316, scutellum, ♀.

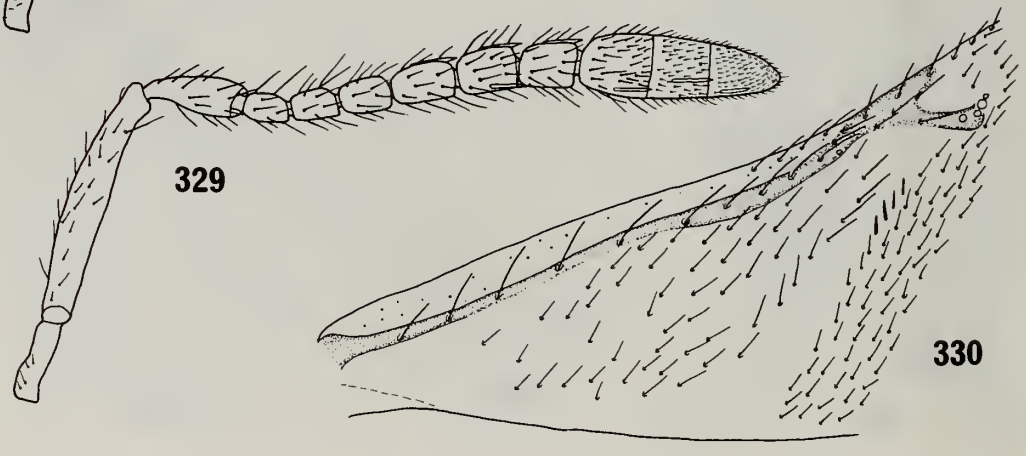


Figs 317–323 *O. papilionis* – 317–319, antenna, variants, ♀; 320, 321, right forewing base, upper surface, variants, ♀; 322, 323, ovipositor, variants.

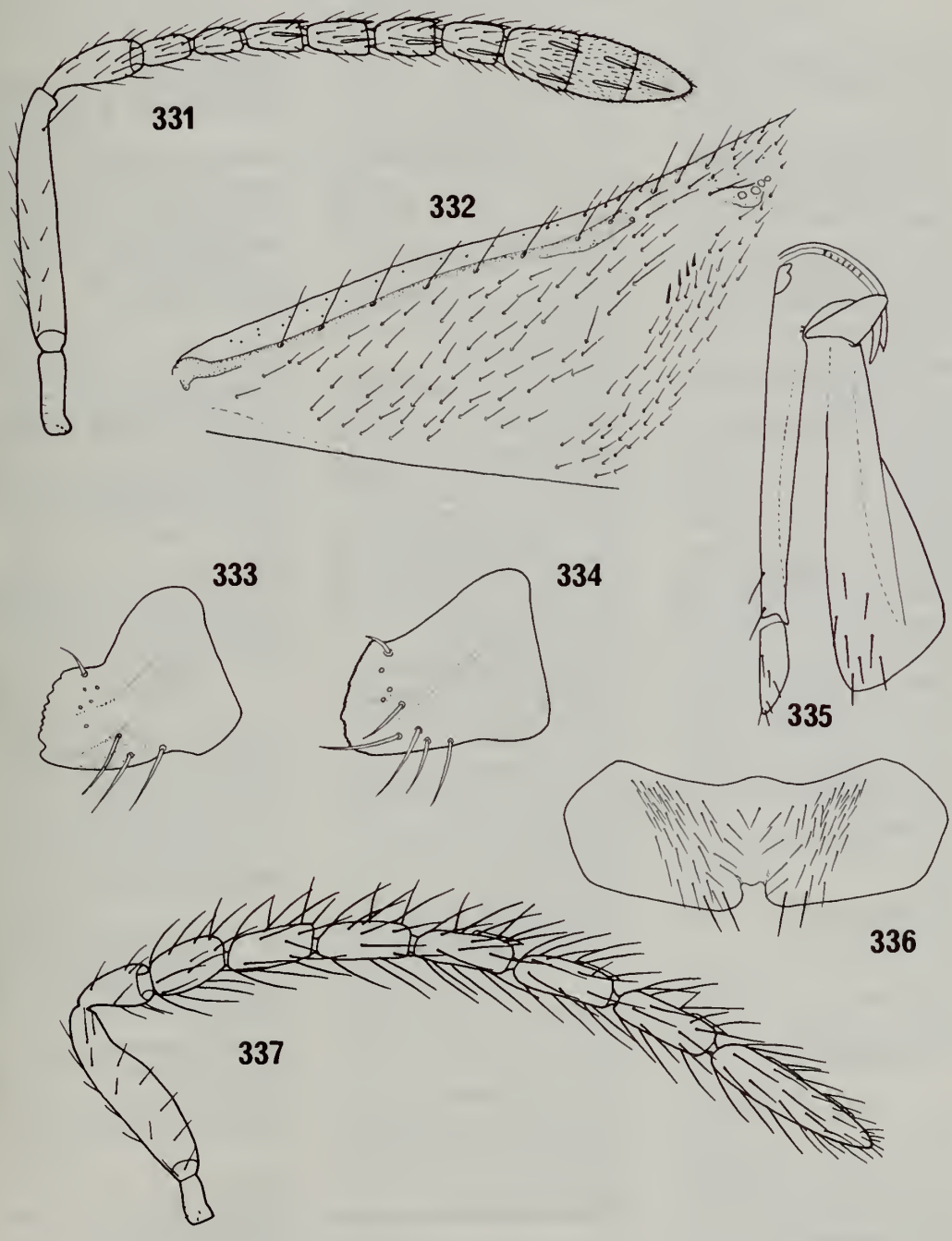








Figs 324–330 *O. papilionis* – 324–326, hypopygium, variants, ♀; 327, head, facial aspect, ♂; 328, right antenna, outer aspect, ♂. *O. utetheisae* – 329, antenna, ♀; 330, right forewing base, upper surface.



Figs 331–337 *O. utetheisae* – 331, antenna, ♀; 332, right forewing base, upper surface, ♀; 333, 334, left mandible, variants; 335, ovipositor; 336, hypopygium; 337, antenna, ♂.

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